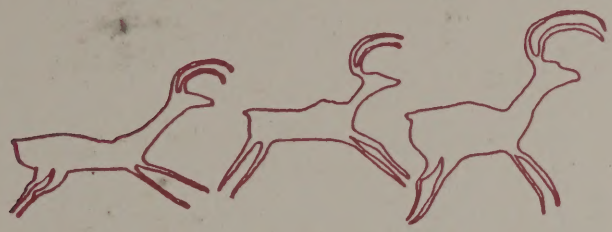
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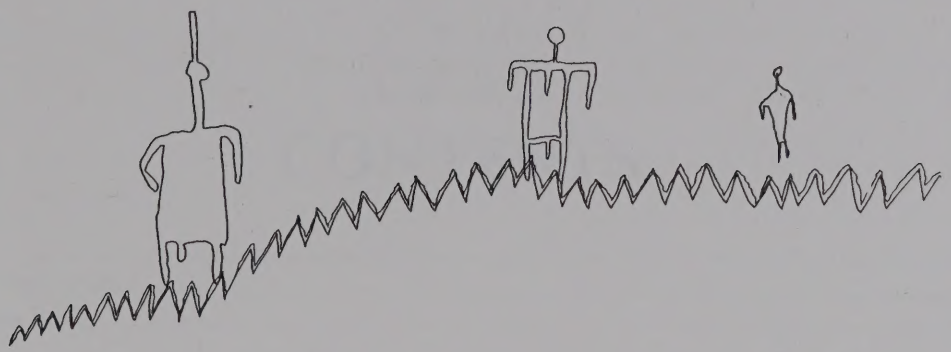
# INTRIGUE OF THE PAST

## A Teacher's Activity Guide for Fourth through Seventh Grades



United States Department of the Interior
Bureau of Land Management

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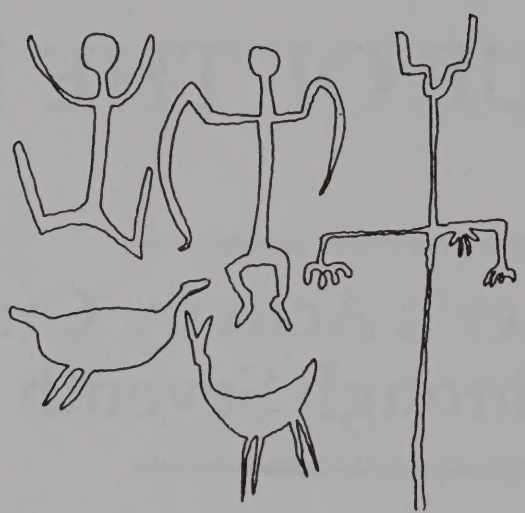
# INTRIGUE OF THE PAST

## A Teacher's Activity Guide for Fourth through Seventh Grades

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United States Department of the Interior
Bureau of Land Management



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Project Archaeology is an outgrowth of *Intrigue of the Past: Investigating Archaeology*, a joint project of the Utah Interagency Task Force on Cultural Resources:

Bureau of Land Management
National Park Service
U.S. Forest Service
The State of Utah



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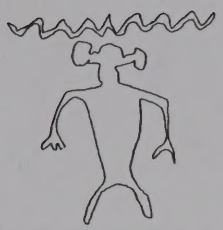
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# PREFACE

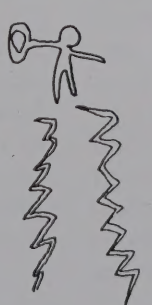
Project Archaeology is an education program sponsored by the United States Department of the Interior, Bureau of Land Management (BLM). The ultimate goal of this program is to educate students to take responsible and thoughtful actions towards our archaeological heritage. Our national lands contain a remarkable and important record of past cultures, but this fragile record is increasingly threatened. The problem is widespread, occurring throughout the United States (and the world), and affecting all kinds of cultural resources, from ancient ruins to historic ghost towns. A primary means of reversing this trend is through education, and actively reaching out to schoolchildren.

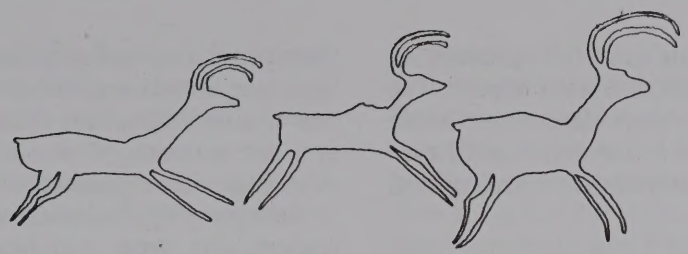
Many people feel a sense of well-being knowing that there still remain places where they can connect with lifeways and peoples gone by. For some, it is an archaeological site, for others it might be an historic trail. People with an ethnic connection to certain sites can experience a tangible association with their cultural heritage. As a society, we all can benefit from an understanding of how people before us lived in the very places we live today. How did they solve problems similar to ours, what can we learn from their experiences, what is the long-term climatic record of a region, and how did it affect the lives of indigenous people? The answers to these questions and many others are contained in archaeological sites.

The Bureau of Land Management is steward of some 270 million acres of public land, located primarily in the western states. More than five million archaeological and historical sites, representing a dramatic record of humanity's 12,000-year presence in the New World, are under custody of the BLM. The BLM is committed to use these resources to teach America's schoolchildren about their nation's cultural heritage, and has developed its Cultural Heritage Education Program to accomplish this ambitious goal. Investigating the mystique of the past is an innovative way to capture students' interest. The Cultural Heritage Education Program builds on that interest to enhance student skills in science, math, higher-order thinking, and communicating. At the same time, a sense of responsibility for stewardship of America's cultural resources is strengthened.

Project Archaeology is one of the programs sponsored by the Cultural Heritage Education Program. It builds on Utah's archaeology education program, *Intrigue of the Past*. The Utah Interagency Task Force on Cultural Resources, representing the Utah divisions of the BLM, U.S. Forest Service, National Park Service, and the State of Utah, sponsored development of the Intrigue of the Past program. While the BLM directed the effort, the participation of the other agencies and institutions has been key to *Intrigue's* statewide use. The premise of interagency cooperation to achieve more than could any one agency alone is borne out by the Utah experience.

Numerous archaeologists, educators, and Native Americans reviewed drafts of this guide and provided many useful suggestions. Seventy-five teachers taught early versions of these lessons in their classrooms; their invaluable experience and creative suggestions helped us to refine and improve the guide.





# INTRODUCTION TO EDUCATORS

The past... we all feel connected to our personal history, how it has shaped the person we are today and will condition who we become tomorrow. Our society too has been formed by its history. For hundreds of generations people have lived in the very places we do, have prospered, failed, and endured. The past offers us a unique perspective on who we are, personally and culturally.

America's past is rich almost beyond belief. Archaeological and historical sites offer the opportunity to travel in time: explore abandoned townsites along the first transcontinental railroad, follow colonial roads, wonder at the huge and ancient earthworks of the Midwest, or contemplate the meaning of drawings and patterns etched in rock by sure hands millennia ago. Refresh yourself at a spring and note by the chipped stone and broken crockery at your feet that you are simply the most recent visitor to a place that has meant survival to uncounted numbers of people. In many places in this country you can stand at a site and take in a landscape little changed by the centuries. You can see what those who came before you saw, and imagine another way of life. You become a richer person for knowing the human history of your home.

Studying the past gives us a rare chance to examine our place in time and forge links with the human continuum. Archaeologists also want to learn about the many cultural lifeways people have chosen, and how these lifeways have changed over time. Anthropology, the parent discipline of archaeology, seeks to understand human behavior in a broad sense. Archaeology contributes to anthropological knowledge by studying behavior through the material remains people left behind—sites and artifacts.

Archaeologists study both the prehistoric and the historic periods, and some archaeological techniques are even applied to modern people and situations. Archaeology is the only way we have to study people who left no written records; in North America, this includes nearly 97 percent of the human occupation span. The methods and issues of archaeology apply to sites of all ages.

## The Challenge of Protecting the Past

Everyone has the opportunity to touch the past and to access information gained by archaeological research. Sadly, however, that opportunity is disappearing. The very accessibility of America's prehistoric and historic sites could soon mean the destruction of our cultural legacy. The number of sites that have not been disturbed or looted is dwindling at an alarming rate. Greed and ignorance are robbing us of our heritage and the opportunity to experience and connect with our past.

An illegal and thriving market in antiquities supports the destruction of sites by looters in search of artifacts. Also, hikers and tourists collect a few pottery sherds or rusty horseshoes, not knowing that they are walking away with the data archaeologists rely on to study the lifeways of past people. Vandals walk on the fragile walls of ruins or spray-paint their names over rock art panels, ignorant or uncaring of the fact they are desecrating places of spiritual significance to Native Americans.

State and federal laws protect sites on public lands, but law enforcement is only part of the solution to protecting our past. Education and teachers can influence whether the schoolchildren of today will know and experience America's rich cultural legacy as the adults of tomorrow.

## Why Teach Archaeology?

Education in archaeology serves two purposes. First, it promotes a sense of responsibility and stewardship of America's cultural heritage. Secondly, archaeology is an innovative means to capture students' attention while addressing many educational concerns in the classroom. This interest is perhaps the most attractive aspect of teaching with archaeology. Almost everyone seems to be curious about it...the intrigue of the past.

Archaeology is an integrative, interdisciplinary field. Archaeologists ask questions rooted in the social sciences, and research those questions using scientific methods. This fusion of the social and physical sciences means that archaeology is an excellent way to teach students to think holistically, to

cellent way to teach students to think holistically, to integrate information from different topics. The study of archaeology can also address some of the concerns of educators today, namely, scientific inquiry, problem solving, cooperative learning, and citizenship skills.

## Project Archaeology as a Teaching Tool

Project Archaeology is a program designed to teach students that America has a rich and fascinating past, that the archaeological evidence of that past is fragile and threatened, and that we all have a responsibility to see to its wise use.

Project Archaeology teaching materials include two main components. The *Intrigue of the Past* Activity Guide forms the foundation, and includes information about the fundamental concepts, processes, and issues of archaeology. A State Handbook has been prepared for many states, and is designed to provide local and regional information which complements *Intrigue of the Past*. The state handbooks include essays about local cultural history, and also a list of available teaching resources (i.e., speakers, museums, places to visit, teaching kits, recommended reading). Together, *Intrigue of the Past* and the State Handbook form an integrated means of teaching archaeology. The Activity Guide provides a comprehensive understanding of archaeology which the State Handbook relates to your students through local examples and cultural history. Designed with you, the educator, in mind, all activities use readily available materials and require little preparation to teach. Many of the activities help you teach required concepts and skills.

Lessons in this Activity Guide teach concepts that apply in any geographic area. For a few lessons, however, it was necessary to use data from an actual site or area to illustrate the concept. In these cases, you are encouraged to substitute local data and examples where practicable.

*Intrigue of the Past* does not include guidance for undertaking time- and labor-intensive activities, such as mock digs and dioramas. While these activities can certainly enliven the study of archaeology, they are best built on the basic ideas presented here, and are not necessary for giving students a grounding in the science and issues of archaeology. Also, be aware that conducting a dig at a real site on public land without a federal or state permit is a violation of law.

You should have received Project Archaeology teaching materials by attending a workshop. If this is not the case, you have only one piece of the complete program. Workshops provide a forum for experiencing the activities firsthand, for asking questions and exchanging ideas with teachers and archaeologists, and for providing current information about archaeology in your area. Also, state, county, and municipal preservation laws and ordinances may affect projects you are planning with your students. Workshops can inform you of this possibility and suggest means to facilitate your project. Additionally, some areas have networks you may want to tap into, such as avocational archaeology clubs, newsletters, and on-going fieldwork. To find out about workshops in your area, communicate with the contact listed in your State Supplement, or with Project Archaeology.

You can contact Project Archaeology , Bureau of Land Management, Anasazi Heritage Center, P. O. Box 758, Dolores, Colorado 81323, (970) 882-4811, with suggestions, questions, and comments.

# HOW TO USE THIS BOOK

Project Archaeology teaching materials support many state curriculum requirements in the subjects of science, social studies, language arts, mathematics, and art. Current teaching strategies such as scientific inquiry, problem solving, values clarification, higher level thinking skills (Bloom, 1956) and teaching/learning styles (Gregorc, 1982; Butler, 1984) are woven into the lessons.

Teaching cooperative skills at all levels of thinking is important. Specific cooperative learning lessons have not been included. Rather, most of the lessons lend themselves to the cooperative learning process.

Instructors are encouraged throughout the guide to adapt the lessons according to teaching/learning styles, class size/age, time, subject, or any other considerations. Educators in scouting, outdoor education, youth groups, and after-school programs will also find this material useful.

## Organization of the Activity Guide

This book is organized into three sections.

- Section One—Fundamental Concepts in Archaeology
- Section Two—The Process of Archaeology
- Section Three—Issues in Archaeology

The three sections are followed by three appendices which contain supporting material.

- Cross-Reference by Skills and Strategies
- Vocabulary
- Rules for Brainstorming

Finally, the References section lists sources used in the lessons.

The Activity Guide is flexible; many of the lessons can be taught individually, although Section One is a prerequisite to the rest of the guide and is to be taught as a whole. Section Three activities are best taught after students have received a background in archaeological concepts and methods. The guide can also be used as a unit or as part of a year's thematic study. Because there is no prescribed sequence, some information is repeated in several places.

# Description of Sections One through Three (see Figure 1)

## Section One - Fundamental Concepts

Activities in this section teach the fundamental concepts necessary for understanding archaeology: **the importance of the past, culture, observation-inference, context, chronology, classification, and scientific inquiry**. Teaching this section as a unit prior to other lessons will prepare students to more easily assimilate information from the rest of the guide. The final lesson, "It's in the Garbage," is an activity in which students use each of the concepts they have covered in Section One to analyze and interpret archaeological evidence.

## Section Two - The Process of Archaeology

This section is about the process of archaeology—**finding, excavating, analyzing, and interpreting archaeological sites and data**. The lessons build on the basic concepts presented in Section One. If taught as a whole, this section will give students a broad understanding of the archaeological process, but the lessons are designed to be taught singly as well.

## Section Three - Issues in Archaeology

Many archaeological issues today revolve around how sites and artifacts are to be conserved and used. This section presents lessons about these issues, and gives students an opportunity to examine their own beliefs about the past. Students need background knowledge to thoughtfully form ideas. Therefore, lessons in this section should be taught only after students have obtained a broad understanding of archaeology. It is very important to give students the opportunity to draw together their knowledge and feelings about the past. These lessons bring closure to the learning process, and promote personal responsibility. A lesson on "Archaeology as a Career" is also included.

The final lesson, "Take Action—Save the Past," is a capstone to the guide. It provides educators and students with a creative problem-solving model if they wish to design and implement a program to protect archaeological resources.

## Appendices

1. *Cross-Reference by Skills and Strategies*: Lessons are cross-referenced according to teaching skills and strategies.
2. *Vocabulary*: An alphabetical listing of all defined vocabulary words used in this guide.
3. *Rules for Brainstorming*: A one-page master that can be copied and distributed to students.

# Organization of Each Lesson

Each lesson is designed to teach one or two archaeological concepts. Lessons are organized in the following format:

**Objective**: highlights the content, process, and product of the lesson.

**Materials**: lists all materials needed.

**Vocabulary**: list of key words, defined.

**Background**: information for the teacher.

**Setting the Stage**: an activity to "hook" the students' interest.

**Procedure**: step-by-step process to teach the lesson.

**Closure**: an activity to conclude the lesson.

**Evaluation**: suggestions for assessing student learning.

**Extension**: some lessons contain additional activities.

**Link**: a reference to other lessons that address the same or similar concepts.

**References**: sources from which background materials were drawn.

A key (at the head of each lesson) lists subjects addressed, skills learned, strategies used to teach skills and concepts, duration, and class size.

Activity sheets for students to complete are included in many lessons. Some lessons include masters which can be used as teaching aids. Both activity sheets and masters are reproducible as transparencies or handouts.

The activities are easy to prepare and all materials are included or readily available.

# Strategies for Using the Guide

The following are examples of ways to use *Intrigue of the Past* to teach units in social studies, science, mathematics, language arts, and art. This guide can also be used to teach a unit in interdisciplinary studies. In all cases you are encouraged to teach all of Section One so that students understand the fundamental concepts of archaeology. Some suggestions for choosing and organizing lessons follow.

## SOCIAL STUDIES

*Intrigue of the Past* lessons can be easily integrated into the social studies curriculum. The following is an example of how to use the lessons; many other strategies are possible.

**Section One**
all lessons

**State Handbook**
focus on cultural history and change over time

**Section Two**
Stratigraphy and Cross-dating
Artifact Classification
Archaeology and Tree-ring Dating
Measuring Pots
Archaeology and Ethnographic Analogy



**Section Three**
Artifact Ethics
Grave Robbers
A Journey Back in Time
The Road Showdown
Take Action—Save the Past

## SCIENCE

Science objectives can be taught using many lessons in the guide.

**Section One**
all lessons

**State Handbook**
focus on technology and past environments

**Section Two**
Stratigraphy and Cross-dating
Artifact Classification
Archaeology and Tree-ring Dating
Pollen Analysis
Experimental Archaeology

**Section Three**
Archaeology—A Conservation Issue
The Road Showdown
State Place Names

## LANGUAGE ARTS

Language arts are used in many lessons; others can be adapted to focus on language.

**Section One**
all lessons

**Section Two**
Archaeology and Ethnographic Analogy

**Section Three**
Archaeology—A Conservation Issue
Artifact Ethics
Grave Robbers
State Place Names
The Road Showdown

## MATHEMATICS

Many lessons contain mathematical applications.

**Section One**
all lessons

**State Handbook**
focus on activities using charts and graphs

**Section Two**
Gridding a Site
Archaeology and Tree-ring Dating
Pollen Analysis
Measuring Pots
Experimental Archaeology

**Section Three**
Archaeology as a Career
State Place Names

## ART

These lessons contain art activities based on the art work of prehistoric people.

**Section One**
all lessons

**State Handbook**
focus on art activities



**Section Two**
Experimental Archaeology

**Section Three**
Rock Art One through Four

## INTERDISCIPLINARY STUDIES

Because of its interdisciplinary nature, archaeology is a perfect topic to teach across traditional subjects. Archaeologists use scientific inquiry (science) to research questions about past cultures/people (social studies). Some of their research requires the manipulation of numerical data (mathematics). Research results must be communicated to an audience using a variety of writing and communication techniques (language arts and art).

Although Section One lessons have been categorized into subject areas, it is suggested they still be taught first as a unit.

### Language Arts

**Section One**
Observation and Inference
Chronology

**State Handbook**
focus on language arts activities

**Section Three**
Archaeology—A Conservation Issue
Artifact Ethics
Grave Robbers
A Journey Back in Time

### Science

**Section One**
Observation and Inference
Context
Classification and Attributes
Scientific Inquiry

**State Handbook**
focus on technology and past environments

**Section Two**
Pollen Analysis
Stratigraphy and Cross-dating
Archaeology and Tree-ring Dating

### Social Studies

**Section One**
Why Is the Past Important?
Culture Everywhere
Chronology
It's in the Garbage

**State Handbook**
focus on cultural history

**Section Two**
Archaeology and Ethnographic Analogy
Experimental Archaeology

**Section Three**
State Place Names
The Road Showdown

### Art

**State Handbook**
focus on art activities

**Section Three**
Rock Art One through Four

### Mathematics

**State Handbook**
focus on activities using charts and graphs

**Section Two**
Gridding a Site
Measuring Pots

Handbook all phases of interdisciplinary study with various readings for children. Your State Handbook "Resource Directory" may recommend books and articles.

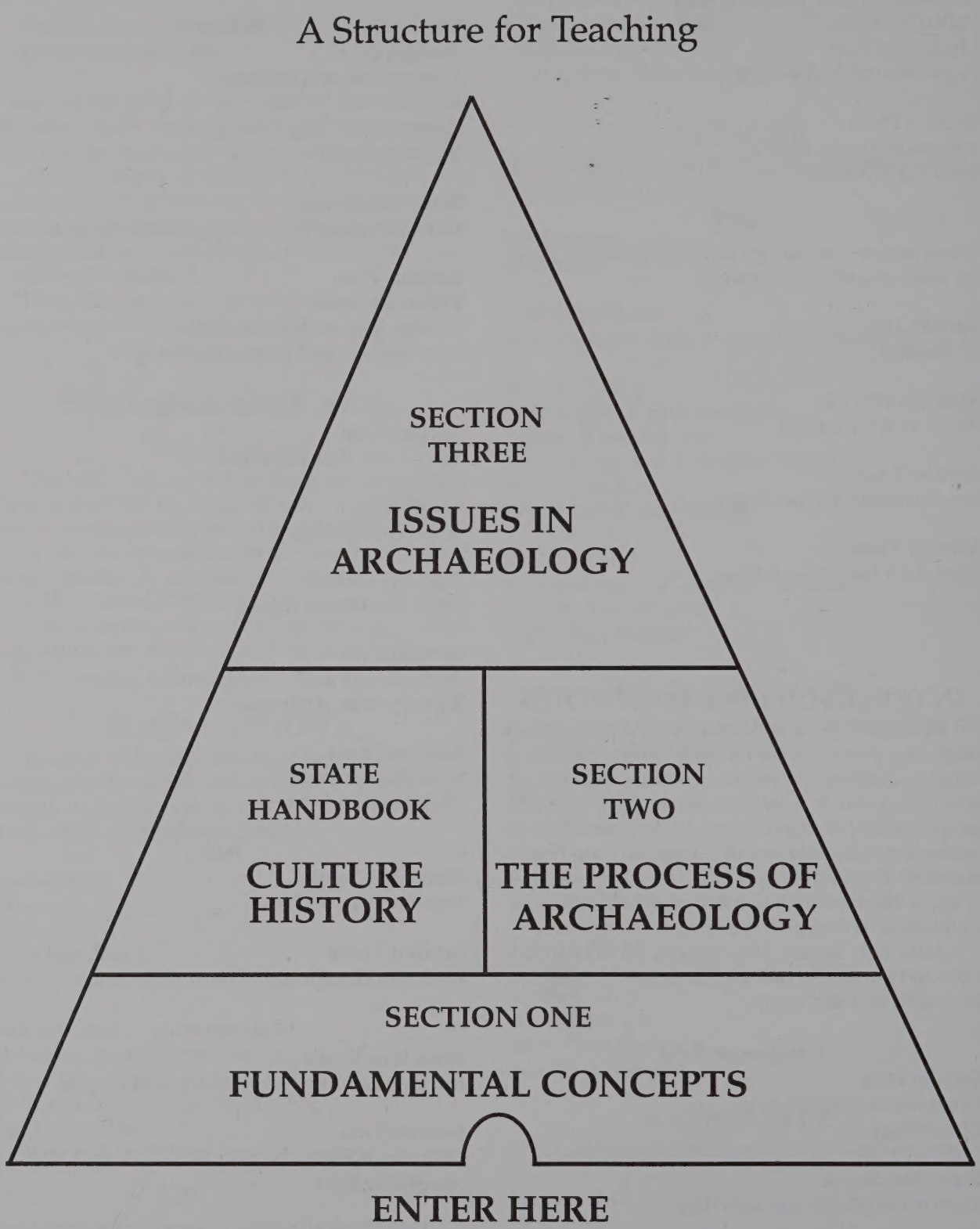
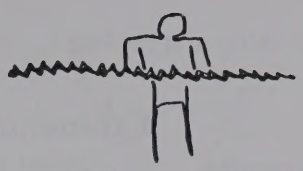



Figure 1. A structure for teaching Project Archaeology.

## SECTION ONE

# FUNDAMENTAL CONCEPTS





1

# WHY IS THE PAST IMPORTANT?

| | |
|---|---|
| **SUBJECTS:** | Science, social studies |
| **SKILLS:** | Knowledge, evaluation |
| **STRATEGIES:** | Brainstorming, discussion, application |
| **DURATION:** | 15 to 30 minutes |
| **CLASS SIZE:** | Any; groups of 3 to 4 |

## Objectives:

As an introduction to the study of our archaeological heritage, students will use a personally owned object to:

1. Share the importance of their past.
2. Connect this importance with reasons why the human past is important.

## Materials:

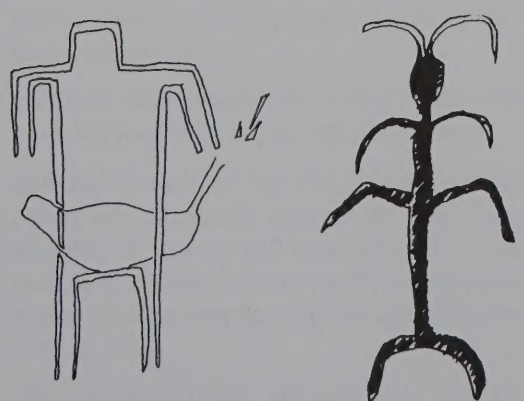
Students bring to class an object, photograph, or drawing of an object that represents their past.

## Vocabulary:

**archaeological site**: a place where human activity occurred and material remains were left.

**archaeology**: a method for studying past human cultures and analyzing material evidence (artifacts and sites).

**artifact**: any object made or used by humans.



## Background:

Sites and artifacts can be messengers from the past. If we know how to read their messages, material remains can tell us about the people who made and used them and then left them behind. Although the owners of the artifacts and the inhabitants of the sites may have lived hundreds or even thousands of years ago, they undoubtedly had many of the same needs and concerns, hopes and fears, joys and sorrows that we have today.

The messengers from the past belong to everyone. Everyone has a right to know how the world came to be and to know his or her place in the world. Material remains and their context play a universal role "... in providing cultural continuity and perspective, and hence in linking past, present and future within the experience of any given human generation" (Lipe, 1984, p. 2).

The link to the past is provided through scientific analysis as well as through traditional values placed on archaeological sites and artifacts. For example, Colonial Williamsburg in Virginia provides a tangible link to the colonial history of America and it is valued for that reason. By examining its historic buildings and objects, Colonial Williamsburg might also provide scientific information about the lives of the historic inhabitants. Similarly, some prehistoric sites throughout the United States may represent the heritage of American Indians and are valued accordingly. These sites are also capable of providing scientific information about the prehistory of the region.



## Setting the Stage:

This lesson sets the stage for Section One. It will help students to begin to discover *why* we study the past. The remainder of Section One explores *how* we study the past.

Assign the students to bring an object (artifact) or photograph from home that tells about their own or their family's past. If the object cannot be brought to class, a drawing or description will suffice.

## Procedure:

1. Share background information and vocabulary.
2. Working in groups of 3 to 4, students tell each other what the object conveys about their past.
3. In a class discussion, ask the following questions:
   a. Is it important for you to know about your past? Why or why not?
   b. Is it important to know about the human past? Why or why not?
   c. Humans have lived in North America for at least 12,000 years. Is it important to know about their lives? Why or why not?
4. What can we learn from the past? The students brainstorm ideas. Some examples: how humans lived in the past and how and why human cultures changed over time.

## Closure:

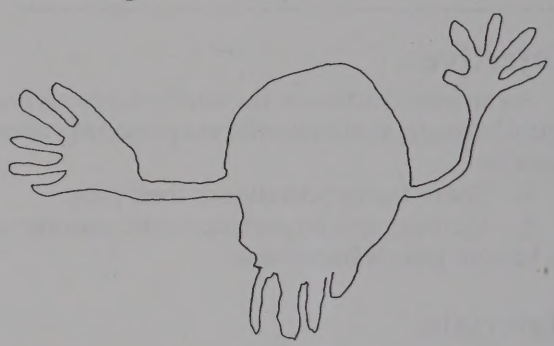
If your past is important to you, what statement can you make about the importance of the past in general?

## Extension:

Repeat this lesson again at the close of your study of archaeology to demonstrate that students have broadened their understanding of archaeology and the past.

## Reference:

Lipe, William D., 1984, "Value and Meaning in Cultural Resources." In *Approaches to the Archaeological Heritage: A Comparative Study of World Cultural Resource Management Systems*, edited by Henry Cleere. Cambridge University Press, Cambridge, U.K.





2

# CULTURE EVERYWHERE

| | |
|---|---|
| **SUBJECTS:** | Social studies, language arts |
| **SKILLS:** | Knowledge, comprehension, analysis, evaluation |
| **STRATEGIES:** | Brainstorming, categorizing, discussion |
| **DURATION:** | 30 to 45 minutes |
| **CLASS SIZE:** | Any |

## Objectives:

In their study of culture students will use a chart to:

1. Show the different ways that cultures meet basic human needs.
2. Recognize that archaeologists study how past cultures met basic needs by analyzing and interpreting the artifacts and sites that those cultures left behind.

## Materials:

"Comparing Cultures" activity sheet for each student.

## Vocabulary:

**anthropology:** the comparative study of human behavior.

**archaeology**: a method for studying human cultures by analyzing material evidence (artifacts and sites).

**cultural relativism**: studying other cultures without making judgments about them.

**culture**: the set of learned beliefs, values and behaviors generally shared by members of a society. "The way the members of a group of people think and believe and live, the tools they make, and the way they do things" (Braidwood, 1967, p. 30).

**ethnocentrism**: the attitude that one's traditions, customs, language, and values are the only right and proper way and that other cultures are inadequate or wrong.

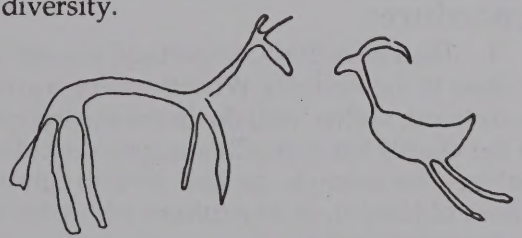
## Background:

Anthropology is the comparative study of humans and their behavior. Cultural anthropologists usually study behavior by observing the members of a cultural group as they live their lives and interact with one another. Archaeologists learn about past cultures by analyzing material evidence (sites and artifacts).

All people everywhere have several basic needs which must be met. These basic needs may be categorized as follows:

1. The need for food and water (economics).
2. The need for protection from the elements (clothing and housing).
3. The need to reproduce the culture (marriage, kinship, education).
4. The need for explanation (religion, philosophy, science).

*What* must be satisfied is universally human. *How* needs are satisfied is cultural. The many different ways that cultures have evolved to meet the basic human needs results in the world's rich cultural diversity.



When studying other cultures, there is a tendency to emphasize the differences among people, and to look at other cultures ethnocentrically. Cultures with less sophisticated forms of technology are frequently portrayed as simple-minded and naive. However, on the contrary, such people often have unequaled understanding, knowledge and adaptability to the environments in which they live. It is important not to accentuate "them" and "us." When scientifically studying other cultures it is necessary to suspend judgment. One culture is neither better nor worse than another, just different. This is the concept of cultural relativism.

A basic assumption of archaeological study is that people who lived in the past had the same basic needs for existence as do people living in the present. Archaeologists are anthropologists who study past cultures by analyzing material remains (artifacts and sites) to learn how people met their basic needs.

Many people mistake archaeology for a swashbuckling "Indiana Jones" adventure, and archaeologists often are thought of as questing after rare and beautiful artifacts. Although it is true that at times archaeologists do find rare and beautiful things, they could more accurately be compared to Sherlock Holmes, a detective of the past, gradually piecing together the culture of a people to understand more about them. A lone artifact discloses very little about a culture. It is by studying many sites and artifacts and their relationship to each other and the environment that one discovers the way people lived. Archaeologists study a people's culture by studying the things they left behind.

## Setting the Stage:

1. List on the board students' responses to the following: What do you need to have in order to live?

2. Now, help students categorize their list. They do not have to arrive at the four categories outlined above. Anthropologists themselves do not agree on how to categorize the needs. For example, the students may come up with eight needs: food, water, shelter, clothing, reproduction, transportation, education, and explanation.

## Procedure:

1. Distribute the "Comparing Cultures" activity sheet to the students. Write the category of basic needs (food, shelter, etc.) down the vertical column on the chart's left side. Choose another culture to analyze—for example, an East African culture, the culture of Mexico, or any culture with which your students are familiar.

2. The students construct the chart, comparing and contrasting the basic human needs as they are met in different cultures.

3. In a class discussion, the students compare and contrast our culture with others. If different cultures seem strange or inferior to the students, inform them that our culture can be baffling to people from another culture. For example, Hindus are horrified at the thought of eating meat; it is against their religion to do so.

4. Explain that because archaeologists can neither ask the people who left the artifacts how they met their needs, nor observe them using the artifacts, past behavior must be inferred from the material remains of the culture. For example, if corn cobs are present archaeologists could infer that the people were farmers.

**Note**: Do not single out or make an example of students in your classroom who are from minority ethnic groups. The attention can be embarrassing and hurtful. However, welcome what these students might freely offer to the study of other cultures.

## Closure:

As you analyze the chart, what do you notice about the ways cultures meet their basic needs? How do archaeologists study past cultures?

## Evaluation:

The students turn in their activity sheets for evaluation.

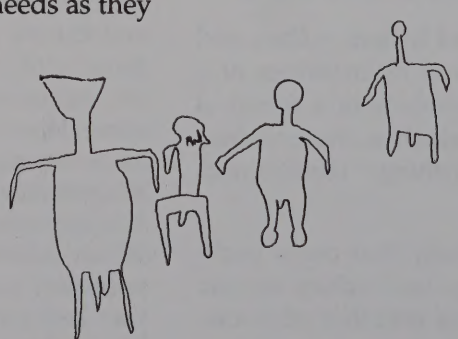
## Links:

Section Two, Lesson 15: "Archaeology and Ethnographic Analogy: The Anasazi and the Hopi"

Section Three, Lesson 27: "State Place Names"

## Reference:

Braidwood, Robert J., 1967, *Prehistoric Men*. 7th ed. Scott Foresman, Glenview, IL.

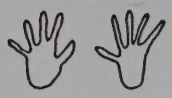


## Comparing Cultures

Name _____

| Basic Needs | Us | Settlers | |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

Use additional sheets if necessary.



3

# OBSERVATION AND INFERENCE

| | |
|---|---|
| **SUBJECTS:** | Science, social studies, language arts |
| **SKILLS:** | Knowledge, comprehension, application, analysis, evaluation |
| **STRATEGIES:** | Scientific inquiry, decision making, problem solving, writing |
| **DURATION:** | 45 to 60 minutes |
| **CLASS SIZE:** | Any; groups of 2 to 4 |

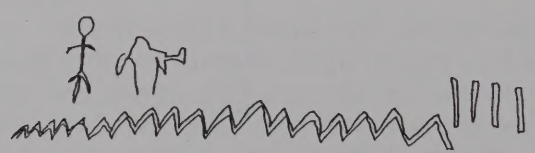
## Objectives:

In their study of observation and inference the students will use worksheets and coins to:

1. Differentiate between observation and inference through a problem-solving approach.
2. Demonstrate their knowledge by analyzing an archaeological artifact and creating their own observation-inference statements.

## Materials:

"Boy in the Water" activity sheet and master, and "An Ancient Coin" activity sheet for each student, and/or transparencies of each. A collection of foreign or U.S. coins (one per each student/team).



## Vocabulary:

**hypothesis**: a proposed explanation accounting for a set of facts that can be tested by further investigation.

**inference**: a conclusion derived from observations.

**observation**: recognizing or noting a fact or occurrence.

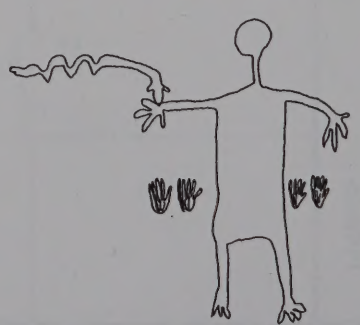
## Background:

Science is based on observation and inference. Any phenomenon being studied must first be observed, whether it be from a satellite or through a microscope. An inference is a reason proposed to explain an observation. The hypothesis is a chosen inference that the scientist will attempt to confirm or disprove through testing.

Archaeologists use observation and inference to learn the story of past people. By making observations about objects (artifacts and sites) they infer the behavior of the people who used the objects. When archaeologists find the remains of a large village (observation), they could infer that the people were farmers. To test that inference (hypothesis), they would look for evidence of farming such as farming implements (like hoes), and food remains from crops (corn cobs and squash seeds). If they find these things, their hypothesis is verified. Archaeologists construct careful hypotheses when making inferences from archaeological data.

## Setting the Stage:

1. Present students with a possible observation-inference scenario from their lives. Example: All the students in this classroom who ate in the cafeteria on Tuesday were ill on Wednesday (observation).
2. What many and varied reasons (proposed inferences) might there be for this illness? Examples: food poisoning, virus, a student uprising.
3. In what ways might one or more of these inferences (hypotheses) be tested in order to come to a conclusion about the cause of the illness? Examples: Send all the students to the school nurse for examination; test the food from Tuesday; obtain a medical history from the parents of each student.



## Procedure:

1. "Boy in the Water"
   a. Project or distribute the master of the "Boy in the Water. " Project or distribute the "Boy in the Water" activity sheet.
   b. Read each statement and ask students to decide if it is a statement of observation or of inference. Ask them to give reasons for their answers.
   c. How might one or more of the inferences (hypotheses) be tested?
   d. Assist students to create a definition for observation, inference, and hypothesis.

2. "An Ancient Coin"
   a. Project or distribute the activity sheet "An Ancient Coin" and explain that the coin was found by an archaeologist at a site.
   b. Which statements are observations and which are inferences? Which observation is each inference based on?
   c. Many different inferences are possible from one observation. What other inferences might be made from observing this coin?
   d. Choose one inference (hypothesis) and think of ways archaeologists might test it by looking at other evidence at the site (e.g., If people are peace loving, archaeologists would not expect to find a lot of weapons or protective gear).

## Closure:

Ask the students to summarize what they learned about the importance of observation, inference, and hypothesis in archaeology.

## Evaluation:

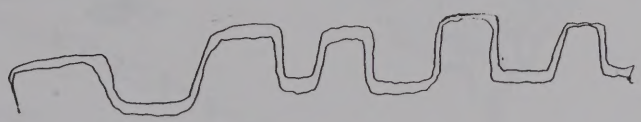
Be an archaeologist.

1. Give each student/team a foreign or U.S. coin and ask them to imagine they have found the coin at an archaeological site.
2. Ask them to create a list of observation statements and inference statements about the coin.
3. Have them choose one inference as their hypothesis and describe how they might test it.
4. Collect and correct their statements.

## Links:

Section Two, Lesson 11: "Artifact Classification"

Section Two, Lesson 15: "Archaeology and Ethnographic Analogy: The Anasazi and the Hopi"



**Boy in the Water Activity Sheet Answers**

1. O 2. I 3. O 4. I 5. I 6. O 7. I 8. I 9. O
10. I 11. I 12. O 13. O 14. I 15. I 16. I

**An Ancient Coin Activity Sheet Answers**

1. O 2. I 3. O 4. O 5. I 6. I





## Boy In The Water



## Boy in the Water

**Name:** _____

Place an 'I' before the statements that are inferences, and an 'O' before the statements that are observations.

___ 1. The boy is in the water.

___ 2. The weather is cold.

___ 3. The tree branch is broken.

___ 4. If the boy crawled out of the water the goat would butt him.

___ 5. The boy fell off the branch.

___ 6. A goat is standing by the pond.

___ 7. The branch will fall on the boy's head.

___ 8. The boy fell off the rocks.

___ 9. There is a sailboat in the water.

___ 10. The sailboat belongs to the boy.

___ 11. The goat will soon leave the pond.

___ 12. The tree by the pond has no leaves on it.

___ 13. There are three rocks in the pond.

___ 14. The tree by the pond is dead.

___ 15. If it rains leaves will grow on the tree.

___ 16. The goat butted the boy into the pond.

## An Ancient Coin

**Name:** _____







Place an "I" before the statements that are inferences, and an "O" before the statements that are observations.

__ 1. There is a representation of a face on one side of the coin.

__ 2. The coin tells us that these were deeply religious people.

__ 3. The words "We Trust the Gods" are printed on the coin.

__ 4. On one side of the artifact is a drawing of leaves.

__ 5. We can tell from the artifact that these were peace-loving people.

__ 6. The face on the coin is a representation of the nation's king.



4

# CONTEXT

| | |
|---|---|
| **SUBJECTS:** | Science, social studies, language arts |
| **SKILLS:** | Knowledge, comprehension, application, synthesis, evaluation |
| **STRATEGIES:** | Game, discussion, problem solving, writing |
| **DURATION:** | 30 to 60 minutes |
| **CLASS SIZE:** | Any; groups of 5 to 6 |

## Objective:

In their study of context students will use a game and a discussion to demonstrate the importance of artifacts in context for learning about past people.

## Materials:

Index cards; "Context" activity sheet for each student or team.

## Vocabulary:

**context**: the relationship artifacts have to each other and the situation in which they are found.

## Background:

The things that people own can tell something about the person. The objects a person has chosen to have can indicate the person's age, gender, and interests. For example, a baseball bat and a football helmet in someone's bedroom suggests that the owner likes sports. Posters of pets and a collection of stuffed animals could mean that the person is an animal lover. The objects (artifacts) can only tell a complete story if they are found together, where their owners left them (in context).

Archaeologists rely on the objects that people made (artifacts) and where they left them (context) to learn the story of past people. Think of a prehistoric pottery bowl, beautifully painted. It has a very different meaning if it is found at a prehistoric site in a grave than if it is found full of corn in an ancient storage room. Its meaning changes further if it is found in someone's modern living room—the bowl has now lost its original context and all connection with its prehistoric owners. It has become only a thing, no longer a messenger from the past.

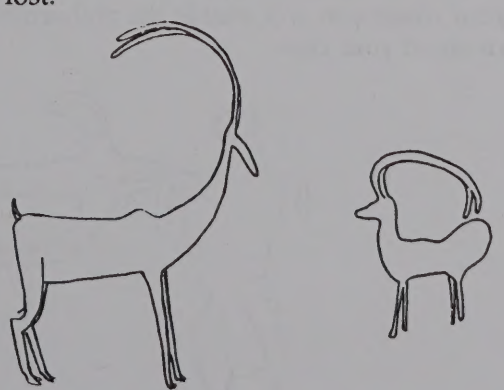
Archaeologists preserve the context of artifacts they recover from sites by recording the location of everything they find. The artifact and its context provide more information to the archaeologist than could the artifact alone. When context is lost, information is lost.

## Setting the Stage:

1. Ask the students: If I had never met you and walked into your bedroom, what would I know about you from the things you have there? Would I know if you were a boy or a girl? Would I know what your interests are? Would I know if you share your room?

2. Think of something in your bedroom that is very special to you. How does that object tell something about you, along with everything else in your room? Everything together tells about you because it is in context. You have selected certain things to have, and these things tell about you when they are all found together.

3. Now imagine that your special object has been taken from you and is found in the city park. How does this change what could be known about you? When it is removed from your room, the object alone tells nothing, and your room is now missing an important piece of information about you. Context has been disturbed, and information about you is now lost.



## Procedure:

The importance of context in archaeology can be demonstrated by the The Game of Context:

1. Tell the students they are going to play a game requiring that they think like archaeologists. Divide the class into groups of 5 to 6 students, and assign each group a different number. Give each student an index card and pencil. As a group, they are to choose a room or type of building such as a hospital operating room, a kitchen, or a hardware store. They decide what objects (artifacts) in the room make it distinctive; then each student writes one clue on his or her card, for a total of 5 to 6 clues per group. Each card also has the group number written on its back side.

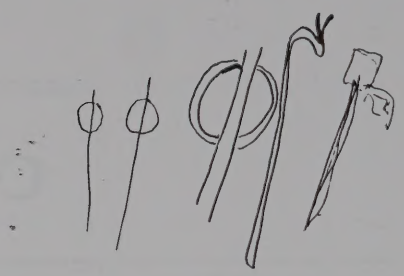
2. The stack of cards from each group is passed to the next group, until every group has seen every stack and tried to infer the function of each place. Be sure the other groups do not hear the correct answers. Each time, before the cards are passed, have a student remove one card and place it off to the side so it does not get mixed up with the other sets of cards.

3. The teacher reviews each group's stack, asking how many groups correctly guessed the rooms' functions.

4. Ask: Is it possible to know the function of the room now? Is one object taken out of context (like a card removed at random) able to give as accurate a picture as are all of the objects in their place of origin? This demonstrates that removing artifacts from a site removes them from their context and makes it very difficult to get a complete understanding of past people.

## Closure:

Artifacts in context are the basis for all understanding about prehistoric people; archaeology is a science of context. Imagine that an archaeologist finds your classroom a thousand years from now. Make a statement about how artifacts in the context of your classroom will enable the archaeologist to learn about your class.



## Evaluation:

Have the students complete the "Context" activity sheet.

## Links:

Section Two, Lesson 9: "Gridding a Site"

Section Two, Lesson 10: "Stratigraphy and Cross-dating"

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**Context Activity Sheet Answers**

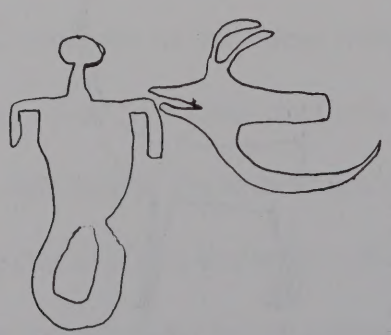
1. List could include items such as ruffled curtains, posters, collections of dolls or model cars, certain types of clothing, photographs, other art work, the colors of furnishings, number of beds and dressers, souvenirs.

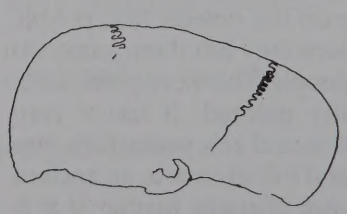
2. The listed items could indicate the student's sex, age, interests, places they have visited, their dreams and hopes, hobbies, amount of allowance, habits, and whether or not they shared their room.

3. Since these things are out of context, they tell nothing about their owner. In fact, it cannot be established if the artifacts once belonged together, so the story of their owner cannot be learned.

4. Artifacts and their context provide the evidence archaeologists need to learn about the past. If clues are removed or moved, information about the past is lost forever.

---





## Context

**Name:** _____

1. List ten things in your bedroom that would tell about you. Imagine the things on your list to be clues for an archaeologist.

2. Imagine an archaeologist finds your ten items. What might he/she know about you?

3. All of the things in your bedroom are in context. What could be learned about you if the things in your bedroom were scattered all over town?

4. Why is it important to leave artifacts in place at archaeological sites?



5

# CHRONOLOGY: THE TIME OF MY LIFE

| | |
|---|---|
| **SUBJECTS:** | Science, social studies, language arts |
| **SKILLS:** | Knowledge, comprehension, application, analysis, evaluation |
| **STRATEGIES:** | Discussion, problem solving, analogy, forecasting |
| **DURATION:** | 45 to 60 minutes |
| **CLASS SIZE:** | Any; groups of 2 |

## Objectives:

In their study of chronology the students will use personal time lines and an activity sheet to:

1. Demonstrate the importance of intact information to achieve accuracy.
2. Compare and contrast their timelines with the chronological information contained in a stratified archaeological site.

## Materials:

Ten strips of colored paper, scissors, glue; "The Time of My Life," "The Life of ___," and "Stratigraphic Section" activity sheets for each student.

## Vocabulary:

**chronology**: an arrangement of events in the order in which they occurred.

**data:** information, especially information organized for analysis.

**stratigraphy**: the layering of deposits in archaeological sites. Cultural remains and natural sediments become buried over time; the layer on the bottom is the oldest, the layer on top is the youngest.

**timeline**: a visual representation of events in chronological order.

## Background:

The proper sequence of events must be known when trying to understand the past. Chronological order means that events are arranged in the order of occurrence, establishing a chronology. One way to display events visually in chronological order is with a timeline. A timeline is divided into equal time segments (month, year, or century, for example), with one end representing the oldest events and the other end the most recent events.

Chronology is something we all use everyday. When somebody tells us a story or when we watch a news report, it only makes sense if we can understand the story as it happened. Archaeologists always try to establish the age of the sites, artifacts, or events they are studying so that they can place them in chronological order. Each piece of information contributes some understanding to the overall story of the past, but only if the information can be placed in chronological order.

Archaeological data are often buried. Sites become buried by the deposition of small-grained particles (sand, clay, silt) through the action of wind, gravity, and water. When archaeologists dig a site, they record the location of what they find, so that chronological order can be established. Objects discovered at the bottom of pits dug by archaeologists are the oldest, while those near the surface are the youngest.

When vandals and artifact-seekers dig a site or collect artifacts from the surface, they remove objects which could place the site in time, and therefore, the archaeologist cannot learn the site's chronological placement. Vandals mix the stratigraphic layers together and archaeological events cannot be placed in order. A page of the past has been torn up and thrown away, destroyed. (While events in our lives typically have a short time duration, archaeologists use the term "events" to signify lifeways over a span of time.)

Everyone can help stop this problem by not digging in sites or collecting artifacts, by refusing to buy artifacts from people who dig and destroy sites, and by reporting people they see digging and collecting to law enforcement officials.

## Setting the Stage:

Tell a familiar story such as Goldilocks out of sequence, leaving some parts out. Ask students to describe the problems with the story. Why is it important to relate sequential information, including all the important details?

## Procedure:

1. Define chronology and state the necessity of establishing chronological order when studying the past.

2. Have the students list ten events in their lives, one on each of the ten strips of colored paper. (Note: It may be helpful to have the students do this as a homework assignment with parental assistance.) Next to each event, students draw an object that might symbolize that event. These events should not have obvious time links, such as "my eighth birthday party," or "I started 4th grade." The events could be things like "my sister was born (rattle)," "the family moved (moving van)," "we went to Yellowstone on vacation (tent)." Students should try to include events from their entire lives.

3. They then shuffle their strips and exchange them with another student, who tries to lay the strips out in correct chronological order with the most recent at the top.

4. The two students who have exchanged strips then tell each other their best guess of the proper chronological order. The strips are then returned to their owners. This is usually a humorous experience for students.

5. Discuss: Were you able to reconstruct the timeline correctly? Why or why not? It is difficult, sometimes impossible, to reconstruct a story if the order of events is not known.

6. Ask students to randomly remove four events from their personal timeline. Ask students if the chronological order would have been more difficult to construct and if the story of their classmate would have been as complete if there were even fewer strips. Connect this activity to archaeological sites by stressing how archaeological data is usually impossible to place in chronological order if artifact collectors have dug up a site (like mixing up the event strips) or if people have removed artifacts (equivalent to removing some of the event strips).

7. Distribute the "The Life of _____" activity sheet (which forms the backing for the timeline). Students glue their own strips in chronological order beginning with the most recent event at the top. They can write the year of the event (or they can number the events one through ten) in the column to the left of their strips.

## Closure:

1. Distribute a copy of the "Stratigraphic Section" activity sheet to each student. Have them lay their timeline next to it.

2. Using a drawing on the chalkboard, different colors of construction paper layered on top of each other, or any other visual model, demonstrate how stratigraphy is formed.

3. Using the background information and the "Stratigraphic Section" activity sheet, discuss the effects of illegal digging on archaeological data recovery efforts.

4. Use the sheet and their timelines to explore the following questions:

   a. In what ways is your chronology similar to an archaeological stratigraphic section? In what ways is it different?

   b. Imagine that you cannot remember significant events in your life. How would that change the history of your life?

   c. In what ways is a hole dug by vandals in an archaeological site similar to a loss of significant events in your life?

   d. In summary, what might you say to an artifact collector about the importance of leaving sites undisturbed, as it relates to the importance of stratigraphy?

## Evaluation:

Have the students complete the "The Time of My Life" activity sheet or use it for a discussion. Or ask the students to present an extemporaneous persuasive speech that defines chronology as used by the archaeologist and explains the importance of intact sites.

## Links:

Section Two, Lesson 10: "Stratigraphy and Cross-dating"

Section Two, Lesson 12: "Archaeology and Tree-ring Dating"

Section Two, Lesson 13: "Pollen Analysis"

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**The Time of My Life Activity Sheet Answers**

1. Students should express regret, or a feeling of being upset. For someone to wantonly destroy the only evidence of another's life indicates that they have little respect for the meaning of that person's life.

2. By extension of the previous question, students should link their feelings about destruction of their timeline to destruction of evidence of past peoples' lives.

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## The Time of My Life

**Name:** _____

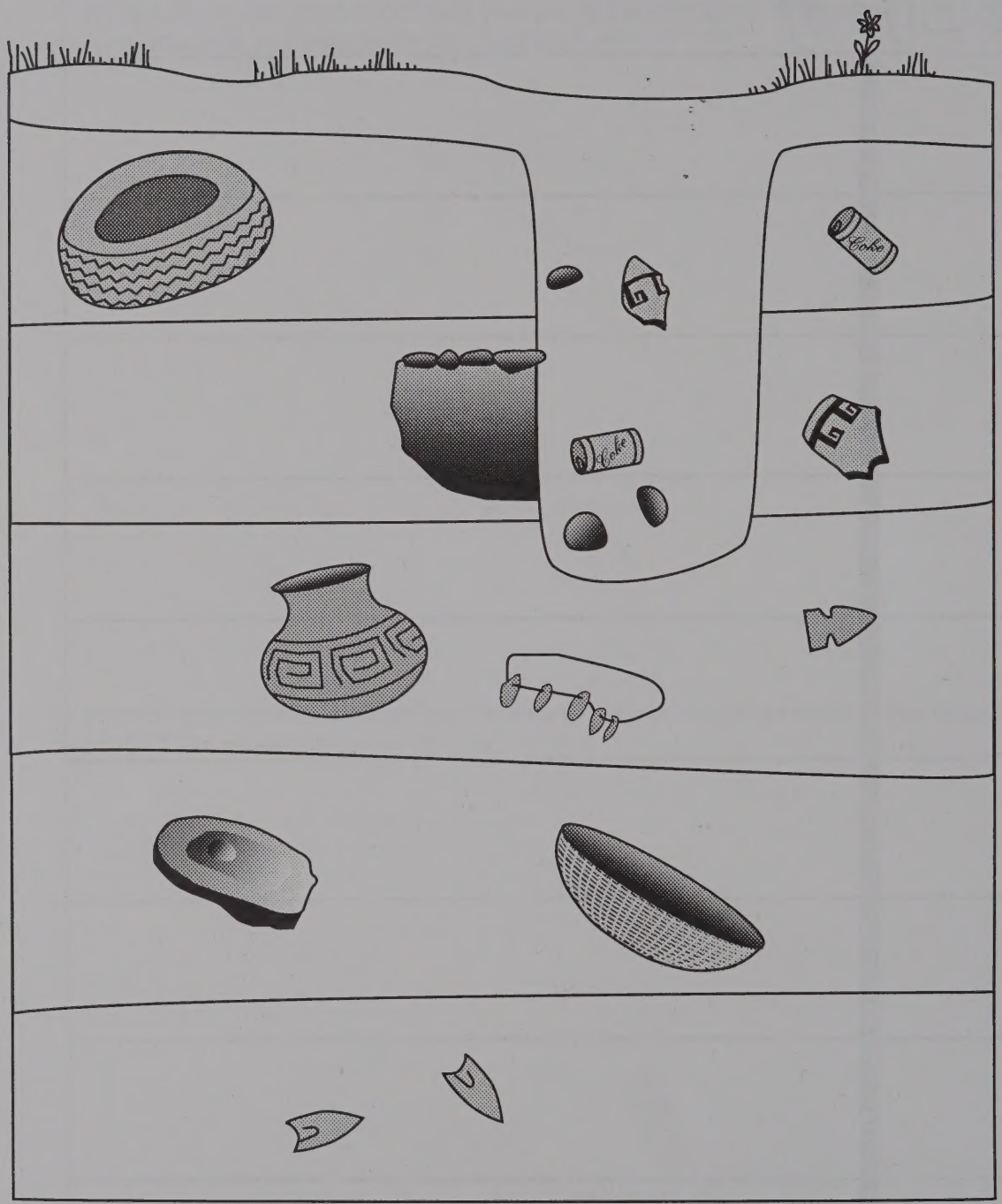
1. Write a short paragraph about how you would feel if your time line was all that would ever be known of you, and somebody tore part of it up.

2. How do you think an archaeologist feels when she or he visits a site that has been dug up by vandals? Give reasons for your answer.



| *The Life of* _____ | |
|---|---|
| **TODAY** | |
| | |
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## Stratigraphic Section



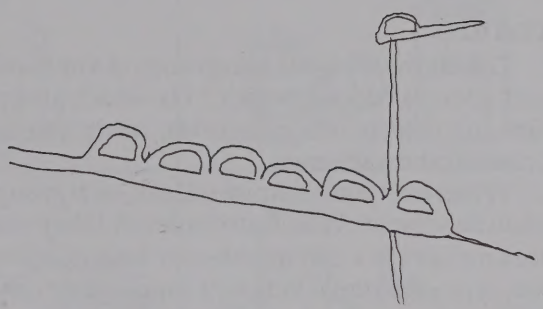

**Key**

- tire
- pot sherd
- rock
- necklace
- fire hearth
- basket
- pop can
- pottery
- projectile point
- mano & metate

6

# CLASSIFICATION AND ATTRIBUTES

| | |
|---|---|
| **SUBJECTS:** | Science, language arts |
| **SKILLS:** | Knowledge, comprehension, application, analysis, evaluation |
| **STRATEGIES:** | Observation, classification, comparing and contrasting, scientific inquiry, decision making, writing |
| **DURATION:** | 30 to 45 minutes |
| **CLASS SIZE:** | Any; groups of 3 to 4 |



## Objectives:

In their study of classification and attributes students will use "doohickey kits" to:

1. Classify objects based on their attributes.
2. Explain that scientists and specifically archaeologists use classification to help answer research questions.

## Materials:

"Doohickey kit" for each group, each kit containing about two dozen familiar objects, such as bolts, string, rocks, paper clips, and cloth (each kit must be identical); "Artifacts From A Mining Camp" activity sheet for each team.

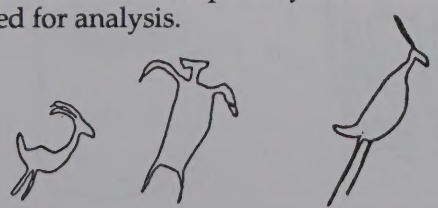
## Vocabulary:

**artifact**: any object made or used by people.

**attribute**: characteristics or properties of an object such as size, color, or shape.

**classification**: systematic arrangement in groups or categories according to established criteria.

**data**: information; especially information organized for analysis.



## Background:

A basic element of thinking is classification. We place objects and situations into conceptual categories in order to make sense of the world so we don't have to respond to each new object or situation as a completely new experience. Classification also helps us to sort a multitude of sensory impressions quickly and enables us " . . . to cope with complexity that might otherwise be overwhelming" (Hull, 1970, p. 150).

We classify objects almost automatically. This is accomplished by choosing certain attributes to pay attention to while ignoring others. We cannot take all attributes into account at once, therefore, we select only a few as being relevant to the task at hand. For example, if we have a group of blocks alike in every way except for color, then color is going to be the attribute used for categorization. If size is variable, then it, too, could become important for categorizing the objects.

Classification of data is an important part of any scientific study, including archaeology. Scientists must categorize data based on various attributes to reduce their complexity and to examine the relationships between types of data. For example, it is not possible to compare each individual house cat with every other member of the cat family. Instead, the category "house cat" includes creatures with certain shared attributes. All "house cats" are not identical, but all fall within a range of variation. The category "house cat" can then be compared with the category "tiger," or "lion," or "lynx."

Objects (artifacts) left by past people form the archaeological data base. Like all other scientists, archaeologists classify data (in this case artifacts and sites) into categories based on their attributes. A site might contain hundreds of pottery sherds which vary in appearance. An archaeologist cannot compare every pottery sherd to every other pottery sherd. Instead, he or she classifies the pottery into categories and compares the categories, thereby greatly reducing the number of comparisons that have to be made.

## Procedure:

1. Divide the students into groups of 4 or 5 and give each group a "doohickey kit." Have each group organize the objects into categories, using one or more classification schemes.

2. When everyone is finished, ask each group to explain its scheme. Which attributes did they use to place an object in a certain category (shape, color, function, type of material, other)? Compare and contrast how each group chose to classify the objects.

3. Explore with students the idea that one classification system is not better than another. The utility of a given classification system depends on what the classifier wants to know. When archaeologists bring artifacts back to the laboratory, they decide what they want to know, and using classification, organize the data accordingly.

4. Devise some simple questions that might be answered by classifying the objects in the doohickey kits. For example: What colors are present? How many different shapes are there (name them)? How might these objects be used? The students will need to regroup the objects based on the question asked.



## Closure:

1. Distribute a copy of the "Artifacts From A Mining Camp" activity sheet to each team of students.

2. Have the students imagine they are archaeologists who have found an old mining camp. What questions might they ask about what happened in the past at this mining camp?

3. The students cut out the boxes on the activity sheet. How might they group these objects to answer their questions?

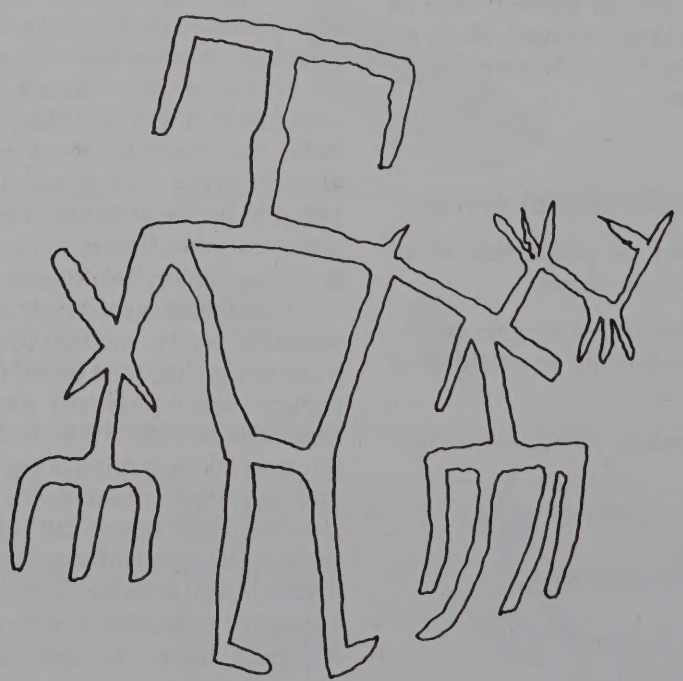
4. Summarize why classification is a useful tool for studying the past.

## Link:

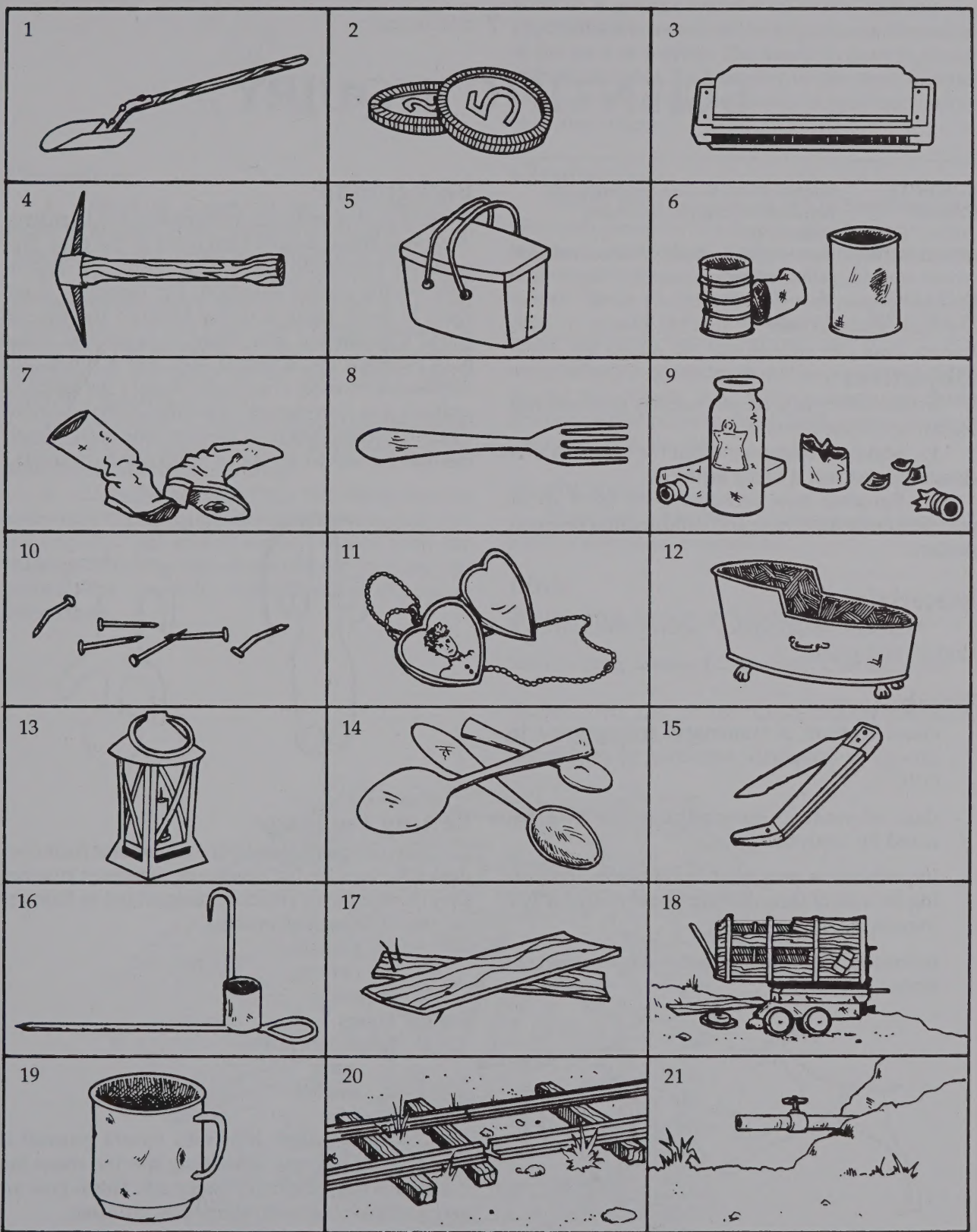
Section Two, Lesson 11: "Artifact Classification"

## Reference:

Hull, William P., 1970, "Attribute Games and Thinking Skills." In *The ESS Reader* by the Elementary Science Study of Educational Development Center, Inc., Newton, MA.



# Artifacts from a Mining Camp




1. shovel; 2. poker chips; 3. harmonica; 4. pick; 5. metal lunch box; 6. tin cans; 7. boots; 8. fork; 9. bottles; 10. nails; 11. locket; 12. bathtub; 13. lantern; 14. spoons; 15.jackknife; 16. candle holder; 17. boards; 18. ore cart; 19. cup; 20. rails; 21. pipe with valve



7

# SCIENTIFIC INQUIRY

| | |
|---|---|
| SUBJECTS: | Science, social studies, language arts |
| SKILLS: | Application, analysis, synthesis, evaluation |
| STRATEGIES: | Scientific inquiry, classification, research skills, writing |
| DURATION : | 45 to 60 minutes |
| CLASS SIZE: | Any; groups of 3 to 4 |

## Objectives:

In their study of scientific inquiry students will use an activity sheet to:

1. Make an inference about the behavior of a classmate and test it using artifacts.
2. Simulate how archaeologists learn about past people by designing and conducting a research project.

## Materials:

"Archaeological Inquiry" activity sheet for each student and group.

## Vocabulary:

**classification**: a systematic arrangement in groups or categories according to established criteria.

**data**: information; especially information organized for analysis.

**hypothesis**: a proposed explanation accounting for a set of facts that can be tested by further investigation.

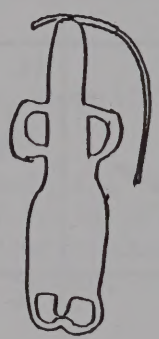
**inference**: a conclusion derived from observations.

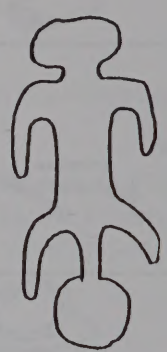




## Background:

The goal of archaeological research is to answer questions about people who lived in the past. Hypotheses formation and classification are dependent on the chosen question. For example, if we want to learn about a settler family's income we could hypothesize that more nonessential items than essential items means they had a significant disposable income. We would classify the relevant artifacts into two classes—essential items and nonessential items. Based on the outcome of the classification we would accept or reject our hypothesis.



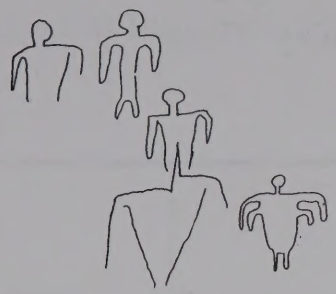


## Setting the Stage:

Have students classify the contents of their own desks, lockers or backpacks in whatever manner they choose. Items could be categorized as follows:

A. Writing instruments
   1. pencils
   2. crayons
B. Paper
C. Books
D. Miscellaneous
   1. gum
   2. money
   3. toys

Ask the students how they would proceed if they wanted to know something specific about the owner of a desk, locker or backpack. This is how an archaeologist begins to study past cultures.



## Procedure:

1. Distribute a copy of the "Archaeological Inquiry" activity sheet, which the students will fill in as they are led through the following inquiry.

2. The inquiry process begins with a question. Archaeologists want to answer questions about past human behavior and must use material remains to do so. Ask the students to consider the following question: "Is the owner of the desk next to you a saver or a thrower-awayer?"

3. **Formulate an hypothesis:** If there is a large number of items not required for school work in the desk, then the owner is a saver.

4. **Classify the data:** Only two categories are essential—items required for school work and items not required for school work. Discuss with the students differing ideas about what constitutes "required items," since this determines how objects are categorized.

5. To answer the research question, ask which category contains the largest number of objects. If there is a greater number of items that are not required, then we **accept the hypothesis:** the owner of the desk is a saver. The students have made an **inference** about the behavior of the desk's owner and have tested their inference (hypothesis) using classified objects.

## Closure:

Divide class into groups of 3 to 5 students and give each group an "Archaeological Inquiry" activity sheet. Have them design and conduct an archaeological research project using objects in the school. Since students know the people in their class, it would be best to visit another teacher's room, the office, the lunchroom, etc. Each project must answer a question about the people who own or use the objects; e.g., what subjects are being studied at this point in time? Each group presents their results to the class.

## Evaluation:

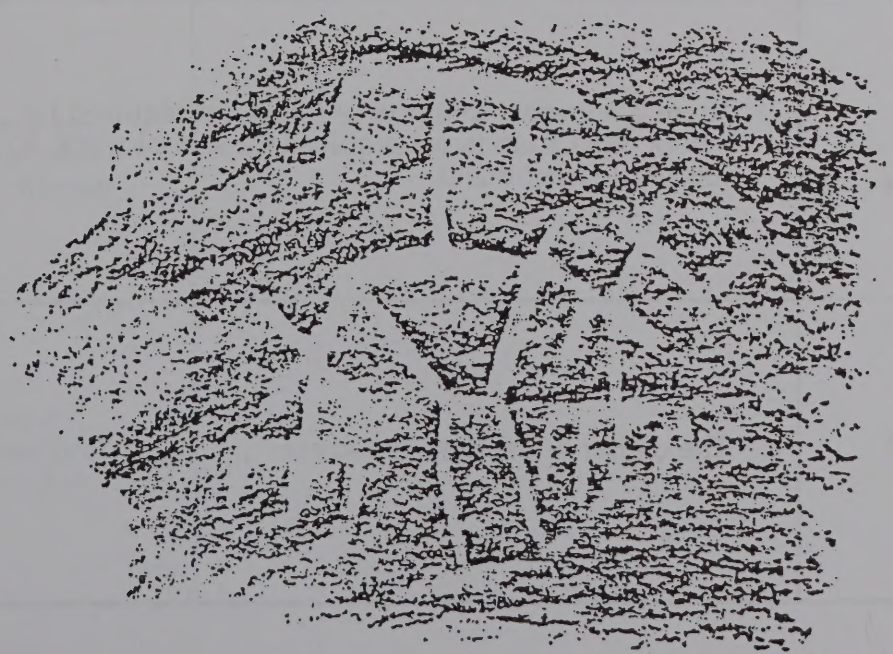
Students turn in their "Archaeological Inquiry" activity sheets for evaluation.

## Link:

Section Two, Lesson 9: "Gridding a Site"

Section Two, Lesson 11: "Artifact Classification"

Section Two, Lesson 16: "Experimental Archaeology: Making Cordage"



## Archaeological Inquiry

| | |
|---|---|
| **Behavioral Question** | Is the owner of the desk a saver or a thrower-awayer? |
| **Hypothesis** | If there is a large number of items not required for school work in the desk, then the owner is a saver. |
| **Classification Categories** | items required for school work<br>items not required for school work |
| **Accept or Reject the Hypothesis** | There is a greater quantity of items not required for school work than items required for school work, so I accept the hypothesis. |
| **Make a Behavioral Inference** | The owner of the desk is a saver. |

## Archaeological Inquiry

**Name:** _____

| | |
|---|---|
| **Behavioral Question** | |
| **Hypothesis** | |
| **Classification Categories** | |
| **Accept or Reject the Hypothesis** | |
| **Make a Behavioral Inference** | |

8

# IT'S IN THE GARBAGE

| | |
|---|---|
| **SUBJECTS:** | Science, social studies, language arts |
| **SKILLS:** | Application, analysis, synthesis, evaluation |
| **STRATEGIES:** | Scientific inquiry, problem solving, discussion, forecasting, research skills, writing, classification |
| **DURATION:** | 60 to 90 minutes |
| **CLASS SIZE:** | Any; groups of 3 to 4 |

## Objectives:

In their study of archaeological concepts, students will analyze garbage from different places to:

1. Demonstrate competence in applying the concepts of culture, context, classification, observation and inference, chronology and scientific inquiry; and
2. Explain how their study of garbage relates to the methods of archaeology.

## Materials:

Filled wastebaskets or small garbage bags from several places in the school, home, or elsewhere, selected to represent rooms of different function; plastic tarps are useful when spreading the garbage out. Undesirable and unsanitary items, such as used tissues or rotting food remains, should not be included. "It's in the Garbage" activity sheet for each group; "Garbage Chart" activity sheet for each group (optional).

## Vocabulary:

**artifact**: any object made or used by humans.

**classification**: systematic arrangement in groups or categories according to established criteria.

**chronology**: an arrangement of events in the order in which they occurred.

**context**: the relationship artifacts have to each other and the situation in which they are found.

**culture**: the set of learned beliefs, values and behaviors generally shared by members of a society. "The way the members of a group of people think and believe and live, the tools they make, and the way they do things" (Braidwood, 1967, p. 30).

**evidence**: data which are used to prove a point, or which clearly indicate a situation.

**hypothesis**: a proposed explanation accounting for a set of facts that can be tested by further investigation.

**inference**: a conclusion derived from observations.

**midden**: an area used for trash disposal.

**observation**: recognizing or noting a fact or occurrence.



## Background:

The unusable or unwanted remnants of everyday life end up in the garbage. By studying what people have thrown away, archaeologists can learn a great deal about a culture. This is true not only of prehistoric peoples who left no written record about their lives, but also of people today. Bill Rathje, an archaeologist, studies the garbage of Americans. He has learned many things about the relationships of human behavior and trash disposal, information useful in studying people of the past and the present. He has found that people will often tell an interviewer what they believe is appropriate behavior, but their garbage tells another story. People frequently say they eat lots of fruit and vegetables, yet their garbage shows they do not. Another example is that people say they recycle more than they actually do (Rathje, 1984, p. 27).

Just as we do not throw our trash any old place, neither did prehistoric people. Their garbage heaps are called middens, and are a rich source of archaeological information about their lifeways. Layers of trash also tell a story over time. Archaeologists

excavate middens slowly and carefully, recording the location of artifacts and samples recovered from the midden. They analyze the tiny fragments of prehistoric meals (bone slivers, seed hulls, plant parts) and charcoal from cooking fires. The animals and plants these remains came from can be identified and archaeologists can learn very precise information about the economy of past people.

If a midden is disturbed and the layers mixed, it becomes impossible to interpret the lifeways of past people. Vandals looking for artifacts dig in middens and they destroy irreplaceable information about the past. They tear pages from the history book of time. Everyone can help by not digging archaeological sites or collecting artifacts, by refusing to buy artifacts from people who do, and by always reporting anyone seen digging at sites or collecting artifacts to law enforcement authorities.

## Setting the Stage:

A famous anthropologist, Franz Boas, reportedly said "... man never lies to his garbage heap." What do you think your family's garbage could tell about you? (Examples: family size, income, preferred foods and activities).

## Procedure:

1. Review the concepts learned in Section One: **culture, context, observation-inference, classification, chronology, and scientific inquiry**. Students will be applying these concepts to their study of garbage.

2. Explain to the students that they are going to be archaeologists, analyzing garbage (middens) to learn about the people who threw it away. Demonstrate some of the information that can be learned from garbage by examining a small amount of trash from your classroom trash can:

   a. What **culture** is this garbage from? Could the garbage be mistaken for that of another culture? Is the garbage in your classroom trash the same or different from classroom garbage in China? Portugal? Your town 100 years ago? Are basic human needs represented in the trash?

   b. What can you **infer** about the behavior of the thrower-awayers and the origin of the garbage based on your **observations**? Is cafeteria trash the same as that from the wood shop? the library? How is a single person's garbage different from that of a family with many children? Is a vegetarian's trash different from a meat-eater's?

   c. Arrange the trash in **chronological** order. On the bottom is the oldest trash, on the top is the most recent garbage. If you find dated items through the trash, such as newspapers or postmarked envelopes or product dates, you can establish a precise date for the trash.

   d. Sort the trash into piles based upon some type of similarity. This is a **classification**, perhaps including categories like paper, food containers, other office supplies.

   e. The trash is obviously from a classroom because you have preserved its **context**, the relationship artifacts have to each other and the situation in which they occur. If you went to your town's landfill, you might find some of the artifacts from your classroom trash but you could not interpret it as coming from your classroom because it has been all mixed up with trash from many other places. Its context has been lost.

   f. Construct a scientific inquiry. An example is: "Was the trash made by very young children?" The hypothesis could be: "If there are few papers with cursive writing in the trash, then the trash came from young children." Classify the trash into two categories: papers with and papers without cursive writing. Accept or reject your hypothesis.

3. Divide the class into groups of 4 to 6 students and give each group a bag of trash. The group analyzes their trash using the activity sheet "It's in the Garbage" (and optionally the "Garbage Chart").

4. Students visit each other's "middens," and a spokesperson from each group presents a summary of their findings.

## Closure:

Lead a discussion using the "Garbage Concepts" questions.

## Evaluation:

Collect the students' activity sheets and reports.

## Links:

Section Two, Lesson 10: "Stratigraphy and Cross-dating"

Section Two, Lesson 11: "Artifact Classification"

## References:

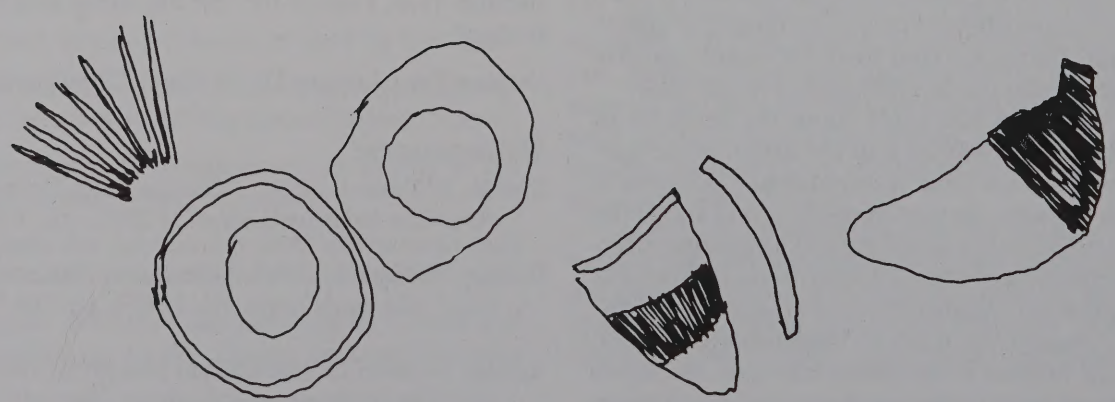
Rathje, William L., 1984, "The Garbage Decade." *American Behavioral Scientist* 28(1), pp. 9-39.

Rathje, William L., 1991, "Once and Future Landfills." *National Geographic* 179(5), pp.116-134.

Rathje, William L., and Cullen Murphy, 1992, *Rubbish: The Archaeology of Garbage*. Harper Collins Publishers, New York, NY.

# GARBAGE CONCEPTS

| Question: | Concept: |
| --- | --- |
| [When students propose an inference about the people who generated the garbage] What would the activity you are proposing (hypothesis) look like archaeologically? What artifacts would you expect to find if your hypothesis is correct? | When archaeologists suspect a certain behavior was occurring, they make an hypothesis about what the archaeological evidence would look like. For example, archaeologists could hypothesize that people butchered large game where it was killed and only took the most desirable parts back to their village. In excavating the village, archaeologists would prove or disprove their hypothesis based upon the animal bones present. |
| Does your study of your garbage tell you everything about American society? Why or why not? | One sample is only a glimpse into a complex society. Just as you only see a small piece of our culture from one sample, so too archaeologists see only a sliver of the past from one site. |
| Do the contents of your garbage can change throughout the year? ... as a result of special occasions like birthdays or company for dinner? What mistakes might an archaeologist make about your family if he/she studied only the garbage from those special events? | Just as someone who wants to completely understand your family would study your garbage over a long period of time, an archaeologist studies many sites because one site cannot reflect the range of activities of a prehistoric society. |
| How would the results of your study be different if we had mixed your individual garbage bags all together into one heap? | Context would have been lost, and only very general statements about the culture that generated the garbage could then be made. This is what happens when vandals dig up sites and say the artifacts are preserved, therefore, no information has been lost. |



## It's in the Garbage

**Name:** _____

**Directions**: Use this activity sheet to take notes during your "excavation." When you have completed your excavation, use the information to write a report about the garbage that addresses the items below. You must give reasons for your answers based on the "evidence" —the artifacts which support your answer.

1. Could you tell when your garbage was thrown away? If yes, how? If no, why not?

2. List two or more inferences you can make about the person(s) who threw the trash away.

3. From where did your garbage come?

4. Which basic human needs does your garbage show are being met?

5. Name two or more of the categories into which you classified your trash.

6. How do you know this garbage is from your own culture?



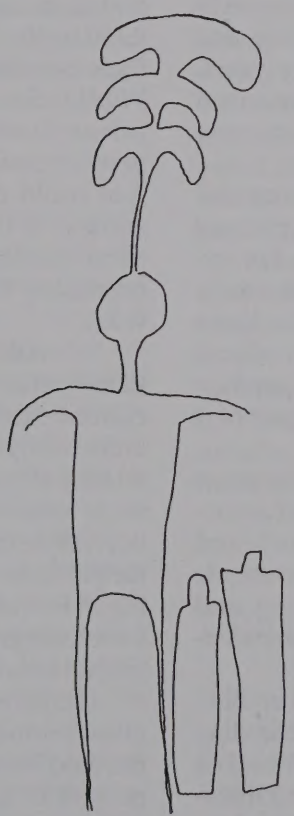
## Garbage Chart

**Name:** _____

| Sketch of item | Description of item (Observation) | Guess as to use or purpose (Inference) |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |

## SECTION TWO

# THE PROCESS OF ARCHAEOLOGY





# INTRODUCTION

Archaeologists employ many processes to address questions about the past. They may **gather new data** by conducting regional surveys to locate archaeological sites. Occasionally sites are partially or completely excavated to address specific research questions or to salvage information prior to disturbance by a development project. All data recovered are thoroughly analyzed following scientific inquiry procedures before conclusions are reached.

Archaeologists often **reexamine data** such as artifact collections, site records, and published reports from previously completed projects. New techniques may allow them to learn from data and artifacts that have been curated for many years. Similarly, archaeologists often revisit old data armed with increased knowledge about the past and a new set of questions.

Archaeologists sometimes use **experimental methods** to help them understand how people may have performed similar tasks in the past. For example, archaeologists who specialize in lithic technology may produce stone tools similar to those made by prehistoric people. The process allows them to better understand how stone tool production was accomplished and how the evidence of it might appear in an archaeological site.

**Descriptions of North American cultures** at the time of European contact provide archaeologists with insights into how artifacts were made and used, how sites were occupied, and how prehistoric peoples may have lived. These observations and analogies are then used to help interpret archaeological evidence.

The following overview describes how archaeologists find and excavate sites, analyze the data recovered, and interpret what they have found. It can be presented to students as background information. The lessons in Section Two illustrate many of the processes and concepts presented in this overview

## Finding Sites

There are two main reasons why archaeologists look for and sometimes excavate sites. First, they may have a research question about the past that makes it necessary to search a certain area for sites, or to excavate a site. Secondly, sites may be endangered by a development project or natural causes, such as erosion, that requires data to be salvaged before the site is destroyed. In both cases archaeologists structure their data collection to address a variety of research questions.

State and federal laws require that land use decisions take into account, among other things, the effect of a project on archaeological and historic sites (cultural resources). These laws apply to all federal and state-managed lands, including those administered by the Bureau of Land Management, National Park Service, U.S. Forest Service, U.S. Fish and Wildlife Service, and the military, and to projects on private land that use federal or state funds or that involve issuing a permit of some kind. Any project that could change land ownership or disturb the surface of the land requires consideration of cultural resources. Typically, the company or agency proposing the project pays for the archaeological work.

A small fraction of the country, probably less than 5 percent, has been systematically explored for cultural resources. Consequently, the first step an archaeologist takes is to review the records to see if an area already has been examined, and if any sites were recorded there. Each State Historic Preservation Office usually maintains a central record center for the state. At this time, interested parties, including Indian tribes, may also be contacted to see if they have concerns or areas of importance within the project area.

If an area has not yet been explored, archaeologists conduct a **survey**, a systematic examination of the land. Since they are trying to find all of the sites present in a project area, they walk about 40 feet from each other in straight lines, back and forth, until all the land has been examined. A compass helps surveyors keep their lines straight. For projects that are linear, such as a proposed railroad or fence, archaeologists walk the strip of land the project will disturb.

Archaeologists are looking for anything that is not natural to the area. They are alert to things like

a row of rocks (possibly the remnant of a wall), depressions or mounds (buried structures), chips of stone (debris from stone tool manufacture), dark soil (possible middens, hearths, or burned structures), and pottery sherds. Because archaeologists want to know how people used resources in their environment, information about where sites *aren't* is also very important.

In the arid West many sites are still visible on the ground surface. Often sites are buried, however, and archaeologists check animal burrows and drainage banks for evidence. In densely vegetated areas, archaeologists will sometimes dig a small hole every 50 feet or so, looking for buried sites.

When a site is discovered, archaeologists record data about it on a site form. Information about the vegetation, soil, elevation, and location is recorded, as well as a description of the site, artifacts and structures present. Photos are taken and a map is made. The site is also evaluated for its information potential, and a determination is made about whether or not the site has buried deposits. This recording process is used for both prehistoric and historic sites.

## Excavating a Site

If the survey was performed because of a development project proposal, archaeologists will recommend to the agency decision-maker what should be done about the cultural resources. Some sites have limited information potential, and only in-depth recording is needed. It will be recommended that sites containing important data or having some other significance (such as spiritual importance to American Indians) be left undisturbed. An effort is made to move a project to avoid disturbing an important site, but sometimes that is not feasible.

If a site is to be excavated, a research design is prepared. This outlines what questions the archaeologists will try to answer and the techniques they will use to excavate and analyze the data. The agency which manages the land, or the landowner, the state archaeologist, and the President's Advisory Council on Historic Preservation will each review the research design to assure it meets professional standards. If all agree, the directing archaeologist is issued a permit to excavate.

Finally the excavation begins (Figure 2). The directing archaeologist assembles a team of excavators. These people may be historians, archaeologists, students, and trained amateurs. The first step is to clear vegetation from the site and establish a grid on the surface (Lesson 9: "Gridding a Site"). The grid is the primary way to maintain **context**, the relationship artifacts and features have to each other. The process of excavation destroys a site, and once it is dug, you can't go back and do it differently. Researchers of the future can study a site they never saw if good notes and maps were made of the excavation. Recording context is the key to interpreting the site from records.

The grid is a Cartesian coordinate system. A grid is set up using a survey instrument (usually a transit), measuring tapes, and wooden stakes. Squares are marked on the ground using stakes for each corner; squares are most often 1 or 2 meters on a side. Each square has a unique identifying number from its grid coordinates. A map is made of the site on graph paper; the graph squares correspond to the squares on the ground. Any artifacts, samples or features (such as a hearth or pit) that are found in that square are labeled with its grid number and the depth below the ground surface at which they were discovered.

Using shovels, trowels, screens, and measuring tapes, archaeologists uncover a site. They move dirt slowly because they don't know what they will be uncovering and they don't want to destroy something by being in a hurry. The locations where artifacts are found are carefully recorded. The excavated dirt is put in a mesh screen and shaken back and forth so that the dirt falls through and artifacts are left on the screen.

Numerous maps, drawings and photos are made during excavation. Each references the grid location. Artifacts and various kinds of samples (pollen, botanical, faunal, tree-ring, carbon-14) are sent to specialists for analysis.

Once the excavation is completed, the site is usually filled with the excavated dirt. A development project will now be authorized to proceed.



## Using the Data

Months after the excavation is completed, results of the analyses will be ready. The time spent actually excavating is the least time-consuming aspect of archaeological research. Processing samples and interpreting the data (Lesson 13: "Pollen Analysis," Lesson 12: "Archaeology and Tree-ring Dating," Lesson 11: "Artifact Classification," Lesson 14: "Measuring Pots") take several times as long as excavation. Artifacts, records and photos are turned over to a public museum, or to the Indian tribe with jurisdiction after the analysis is complete. A public museum assures the availability of the artifacts and information to future researchers, as well as for use in a display.

Archaeologists make extensive use of comput-

ers and statistical data analysis. They compare their data with data derived from other studies. They may use ethnographic analogy—studying modern groups of people for clues about what archaeological patterns might mean, or what use artifacts could have had (Lesson 15: "Archaeology and Ethnographic Analogy: The Anasazi and the Hopi"). They address the questions they originally posed in their research design.

Sometimes artifacts are experimentally replicated to learn what methods of manufacturing may have been used prehistorically (Lesson 16: "Experimental Archaeology: Making Cordage").

A strong professional ethic dictates that excavation results be published, so that the information is available to everyone. Publications have most often been written in the idiom of professional archaeology, accompanied by all the jargon that any profession develops. There is a growing emphasis in professional archaeology to communicate with the general public, and to write and present information in more general terms.

## Dating Archaeological Samples

Archaeologists have two ways of placing events, sites, and artifacts in chronological order. **Relative dating** can order things in relation to each other, but they are not anchored to a calendar (Lesson 10: "Stratigraphy and Cross-dating"). Think of a trash can; items on the bottom were placed there prior to the items on the top. Relative to each other, the items on the bottom represent older actions than those on the top, but we don't know what day or what year the trash can was filled.

**Absolute dating** can establish a calendar year for an artifact, site or event; archaeologists have several methods to learn an absolute date. Tree-ring dating can be very precise, whereas carbon-14 dating provides a range of possible dates, i.e. A.D. 500 ± 30, means the date is between A.D. 470 and A.D. 530. To return to the trash can example, if something in the garbage had a date on it, like a newspaper or a postmarked envelope, then we could propose that the garbage in the same layer with it is also about that old, and we know an absolute date for its disposal.

In North America, archaeologists use four absolute dating methods: tree-ring, radiocarbon, obsidian hydration, and archaeomagnetic. Tree-ring dating is explained in Lesson 12.

**Radiocarbon dating** (also called carbon-14 or $^{14}C$) can be used on anything organic, anything that once was living. The method was developed in 1949 by two physicists, W.F. Libby and J.R. Arnold and it revolutionized the young science of archaeology: "...living organisms build up their own organic matter by photosynthesis and by using atmospheric carbon dioxide. The percentage of radiocarbon in any living organism is equal to that in the atmosphere. When the organism dies, the carbon-14 ($^{14}C$ = a radioactive isotope) atoms begin to disintegrate to carbon-12 at a known rate, so that after 5,568 years, only half the original amount will be left; after 11,136 years, only a quarter, and so on. It is possible to calculate the age of an organic object, such as charcoal or wood, by measuring [through a laboratory procedure] the ratio of $^{14}C$ to $^{12}C$ left in the sample" (Fagan, 1980, p. 13).

Carbon-14 dating destroys the sample and requires a fair amount of material. For example, about a quarter-cup of charcoal is needed for a $^{14}C$ date. Sometimes archaeologists are reluctant to destroy an object, or there is not enough material for a standard $^{14}C$ date. Fortunately, there is a newer method of radiocarbon dating that requires very little organic material—about the size of the head of a pin is enough. This method is done with an accelerator mass spectrometer, and is called an **accelerator** date. An accelerator date costs two to three times what a standard $^{14}C$ date costs.

**Obsidian hydration dating** is based on the principle that all glass—natural and human-made—absorbs small amounts of atmospheric moisture. Obsidian (volcanic glass) was frequently used by prehistoric people to make tools. A fresh surface was exposed when the tool was made from an obsidian nodule, and so the absorption started on an unweathered surface. An hydration "rind" develops on the obsidian, and the rate of hydration can be determined. Therefore, by examining a thin slice of obsidian under a microscope and measuring the width of the rind, the age of the tool can be determined. Problems exist with this technique and it is not widely used. However, research continues and may make obsidian hydration dating a more reliable method.

**Archaeomagnetic dating** is based on the fact that the earth's magnetic poles have changed location over time. The time and path of the North Pole's wanderings is roughly known. Some soils contain tiny magnetic particles, such as iron oxide. When soil is heated above 670°, the particles are "loosened" in the soil, and when they cool the particles align with magnetic north. Archaeologists collect small cubes of burned earth, such as that around a hearth, and send them to an archaeomagnetic dating laboratory. The particles will be pointing to the place where magnetic north was at the time they were last heated and cooled, and the date of that event can then be determined.

## Excavating a Site

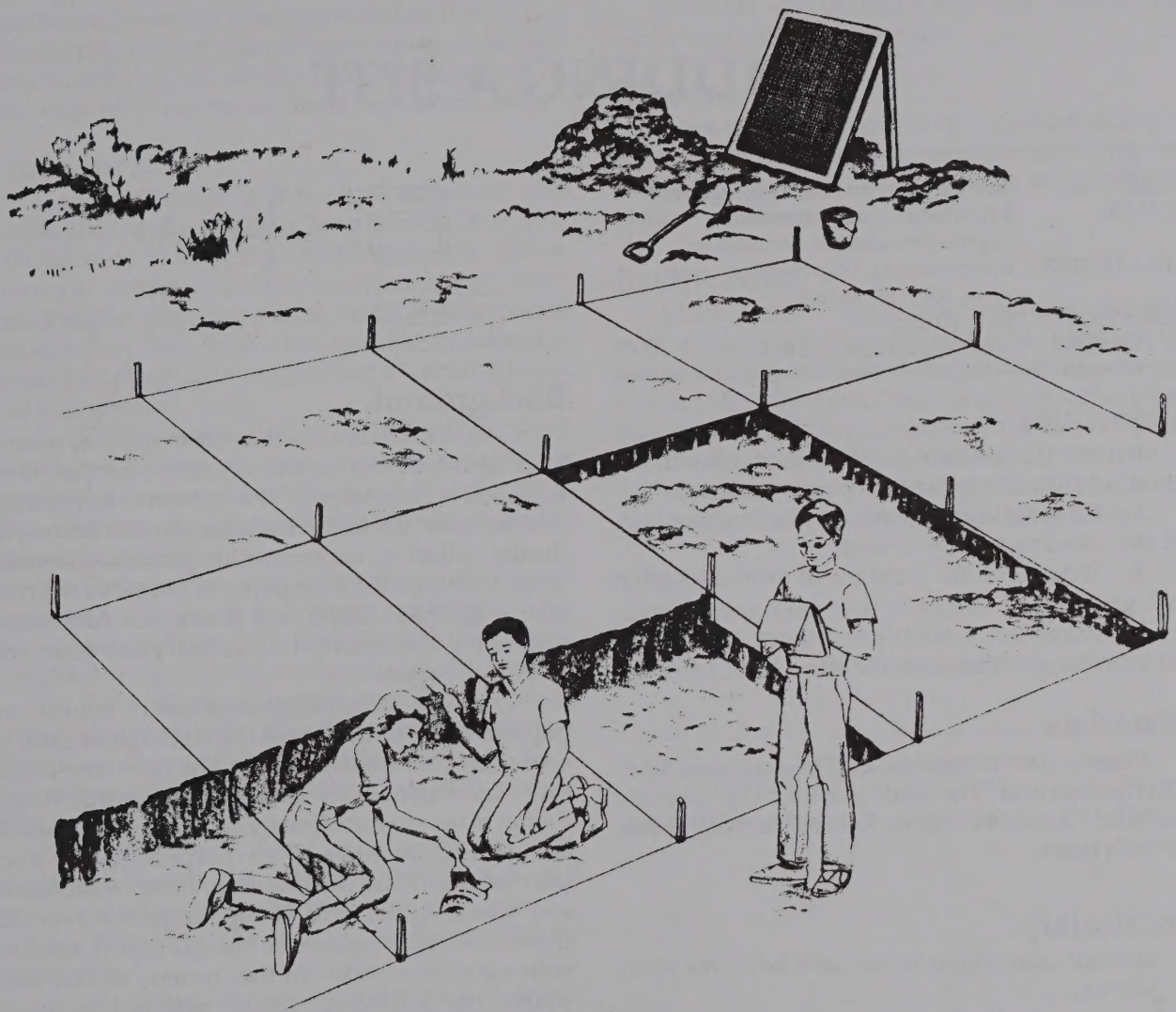
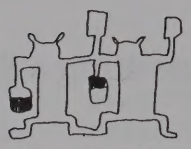


Figure 2. Drawing which shows how a site is excavated.



9

# GRIDDING A SITE

| | |
|---|---|
| SUBJECTS: | Science, mathematics, language arts |
| SKILLS: | Knowledge, comprehension, application, analysis, evaluation |
| STRATEGIES: | Brainstorming, map reading, using scale, scientific inquiry |
| DURATION: | 45 to 60 minutes |
| CLASS SIZE: | Any; work teams of 2 to 4 |

## Objectives:

In their study of site gridding students will use a map and the Cartesian coordinate system to:

1. Establish a grid system over an archaeological site, labeling each grid unit.
2. Determine the location of artifacts within each grid unit.
3. Construct a scientific inquiry concerning the location of artifacts on the site.

## Materials:

Rulers, transparencies of "The Lakeside Site" activity sheet and "The Grid" master, "The Lakeside Site" and "Artifact Location Record" activity sheets for each team.

## Vocabulary:

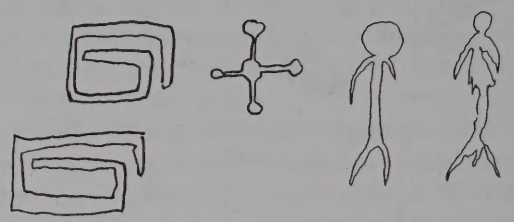
**datum**: something to use as a basis for measuring.

**site datum**: an arbitrarily established point from which the entire site is measured and recorded.

**Cartesian coordinate system**: two- or three-dimensional graph based on intersecting, perpendicular incremented lines or planes.

**flake**: a thin piece of stone removed from a nodule by striking it with a flaker made of bone, antler, or other stone. Flakes have sharp edges, and could be used as cutting implements. Flakes were also further shaped into tools or were left as waste by-products of flintknapping.

**grid unit**: a specific spatial area on the Cartesian coordinate system, designated by the coordinate in one corner (usually the southwest corner).



## Background:

Once a site has been dug (or in the case of sites with no depth, the surface artifacts have been collected), it is gone forever, and can never be replaced with another just like it. Because sites are destroyed during collection or excavation processes, archaeologists record them on paper to preserve the context of all the artifacts and structures. Archaeologists of the future can study a site if good notes and maps were made.

One way archaeologists preserve context on paper is through the use of the rectangular grid, or Cartesian coordinate system. The first step in the excavation process is establishing a grid. A site datum is set at an arbitrarily chosen location and is designated as (0,0). Two perpendicular axes intersecting at the site datum are then established and a rectangular grid is superimposed over the entire site. Each square on the ground is marked with numbered stakes in the corners, so that each square has a unique "name" referred to by its coordinates. The coordinates indicate the distance of a given point north, south, east, or west from the site datum.

Once the grid is established, all artifacts and structures are measured and recorded using the system. Before excavation actually begins all artifacts visible on the surface are collected and their locations on the grid are recorded. As excavation procedes, materials found under the surface are similarly recorded and collected. When the archaeologist returns to the laboratory, the maps and the data recorded in the field can be used to make inferences about past events and the lifeways of the site's inhabitants. The exact location of each artifact transported back to the laboratory is known—the object can be tied to its place in the site.

## Setting the Stage:

Have the students imagine they are a team of archaeologists who have found an archaeological site. Artifacts, including projectile points, pottery sherds, and stone flakes are scattered on the surface of the ground. They want to make a map of the site. How might they accurately record the location of the artifacts? Have the students brainstorm ideas.

## Procedure:

1. Project the map of the "Lakeside Site" and explain this is the site they have found. Overlay a transparency of the grid matching the site datum points, to demonstrate that an archaeologist establishes a grid over the site to assist with accurate recording of data. Share background information about the importance of gridding a site for current and future study.

2. Distribute the "Lakeside Site" activity sheet to each team. Point out the site datum in the lower left hand corner and explain that this is the point from which the grid is established. The name of the site datum is (0,0).

3. Using rulers, each team will establish a grid system using the scale 1"=1 meter, starting from the tip of the datum (see "The Grid Sheet"). It is helpful to model this procedure on the overhead projector.

4. Label each point on the grid. The southwest corner of each unit becomes the reference (designation) for that unit. Example: (1,2); (2,2); (2,3). Each coordinate indicates the location east and north of the site datum.

5. Using the "Artifact Location Record" students will record the grid unit designation and count and name the artifacts in each grid unit.

6. Following the procedure of scientific inquiry ask:

   a. What do you notice about the distribution of the pot sherds? (**observation**)

   b. Why is there a concentration of pot sherds in part of the site? (**List some inferences.**)

   c. Choose one inference and formulate an hypothesis from it. Describe how the hypothesis might be tested.

   **Example:** There are a lot of pot sherds in one location. We might infer a pottery vessel broke here. If all of the sherds have similar attributes and fit together, then we could accept the hypothesis that a vessel broke in this location. What other reason could explain the concentration of sherds?

   **Note:** The students will not be able to actually test the hypothesis without access to the artifacts. This exercise is designed to have them think like archaeologists.

   d. Conduct a similar inquiry using the stone flakes or other artifacts.

## Evaluation:

Students turn in their completed "Artifact Location Record" for evaluation.

## Closure:

Summarize the importance of gridding archaeological sites to assist with accurate recording and making inferences from data, now and in the future.

## Extensions:

Extension 1. With older students, precisely map artifacts within each grid unit. Measure the distance north and east of the grid unit's southwest corner to find the exact distance of each artifact from the site datum (0,0). Examples: (2.1, 4.6) or (3.3, 8.8).

Extension 2. Create a site on the playground by depositing "artifacts", and then gridding the playground. Map the "artifacts" using the grid.

## Links:

Section One, Lesson 4: "Context"

Section One, Lesson 7: "Scientific Inquiry"

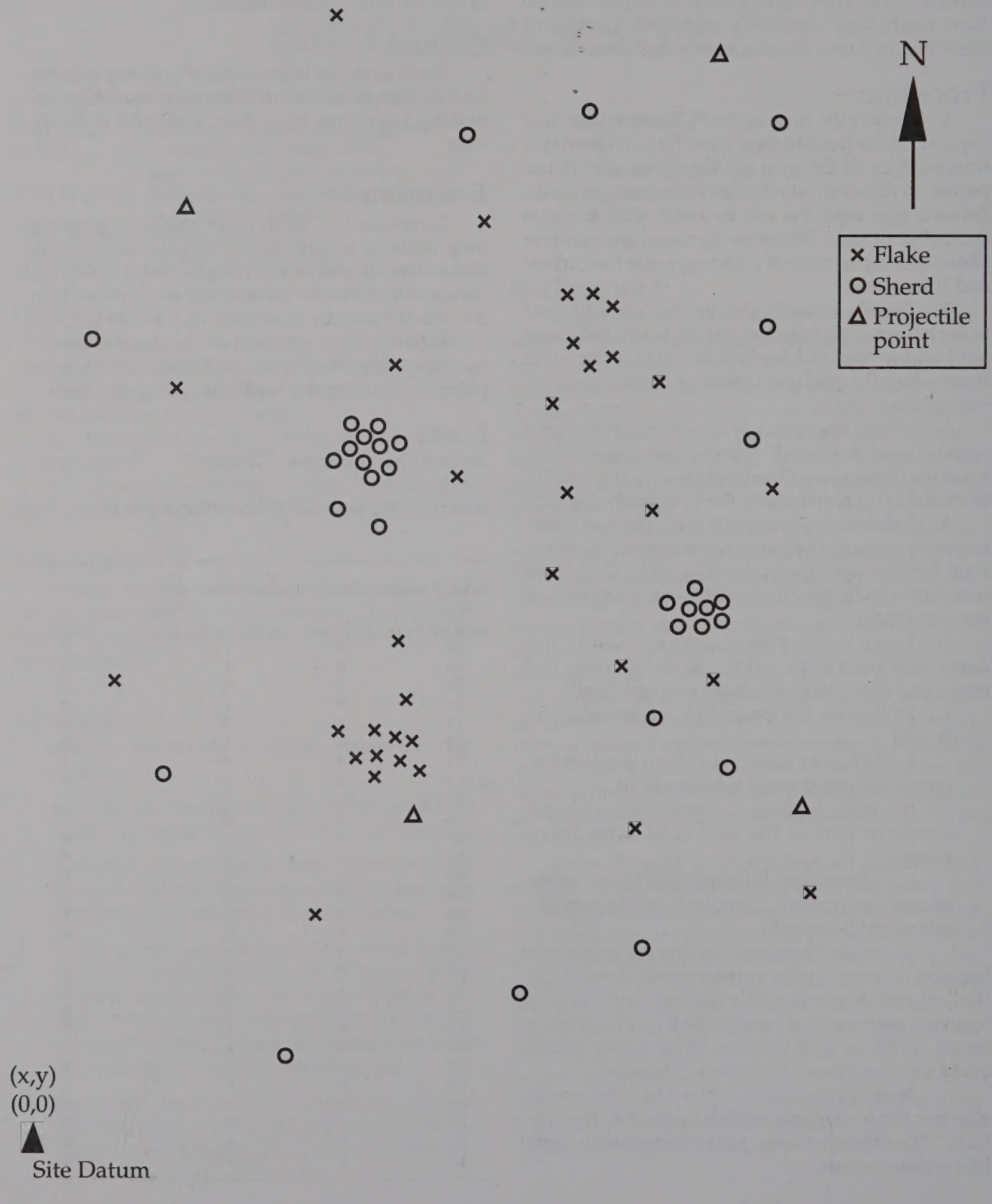
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**Artifact Location Record Answer Sheet**

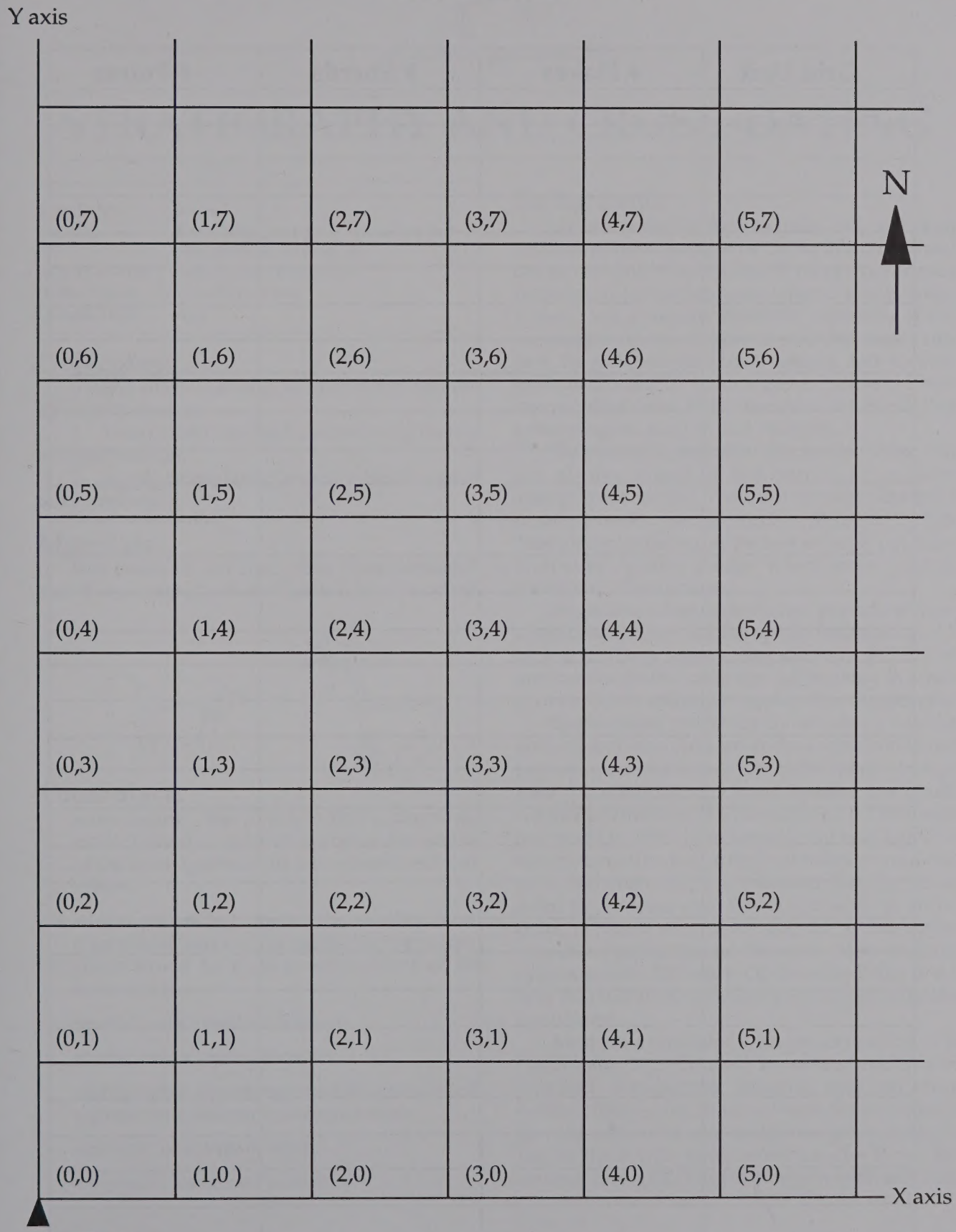
| Grid Unit | # Flakes | # Sherds | # Points |
|---|---|---|---|
| 1,0 | 0 | 1 | 0 |
| 3,0 | 0 | 1 | 0 |
| 2,1 | 1 | 0 | 0 |
| 4,1 | 0 | 1 | 0 |
| 5,1 | 1 | 0 | 0 |
| 0,2 | 0 | 1 | 0 |
| 2,2 | 9 | 0 | 1 |
| 4,2 | 0 | 2 | 0 |
| 5,2 | 0 | 0 | 1 |
| 0,3 | 1 | 0 | 0 |
| 2,3 | 1 | 0 | 0 |
| 3,3 | 1 | 0 | 0 |
| 4,3 | 2 | 8 | 0 |
| 2,4 | 0 | 12 | 0 |
| 3,4 | 2 | 0 | 0 |
| 4,4 | 1 | 0 | 0 |
| 5,4 | 1 | 1 | 0 |
| 0,5 | 0 | 1 | 0 |
| 1,5 | 1 | 0 | 0 |
| 2,5 | 1 | 0 | 0 |
| 3,5 | 5 | 0 | 0 |
| 4,5 | 3 | 0 | 0 |
| 5,5 | 0 | 1 | 0 |
| 1,6 | 0 | 0 | 1 |
| 3,6 | 1 | 1 | 0 |
| 2,7 | 1 | 0 | 0 |
| 3,7 | 0 | 1 | 0 |
| 4,7 | 0 | 0 | 1 |

## The Lakeside Site

**Name:** _____



## The Grid Sheet



## Artifact Location Record

**Name:** ____________________

| Grid Unit | # Flakes | # Sherds | # Points |
|---|---|---|---|
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10

# STRATIGRAPHY AND CROSS-DATING

| | |
|---|---|
| **SUBJECT:** | Science |
| **SKILLS:** | Knowledge, comprehension, application, analysis, evaluation |
| **STRATEGIES:** | Observation, discussion |
| **DURATION:** | 15 to 30 minutes |
| **CLASS SIZE:** | Any |

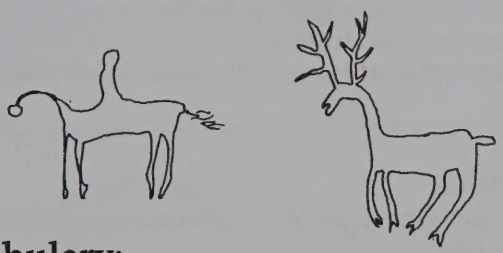
## Objectives:

In their study of stratigraphy students will use an activity sheet to:

1. Interpret archaeological strata using the law of superposition.
2. Apply cross-dating to determine the age of other artifacts.

## Materials:

Five books of any size, "Site Near Richfield" and "Cross-dating" activity sheets for each student.



## Vocabulary:

**cross-dating**: the principle that a diagnostic artifact dated at one archaeological site will be of the same approximate age when found elsewhere.

**diagnostic artifact**: an item that is indicative of a particular time and/or cultural group; a computer would be a diagnostic artifact of the modern age.

**spatial**: concerned with space.

**strata**: many layers of earth.

**stratigraphy**: the arrangement of layers of earth representing different geologic events.

**stratum**: one layer of earth.

**temporal**: concerned with time.

## Background:

Natural materials such as rocks, soil, and plant and animal remains occur on the earth's surface and can accumulate in layers. Each layer or stratum may be distinguished by its physical characteristics: color, texture, and structure. Similarly, materials of human origin are also deposited onto the earth's surface. In archaeological sites natural and human-generated materials occur together in layers. These layers, called strata, form a record of past events that archaeologists analyze and interpret.

The materials deposited first are the oldest and are always found at the bottom of a given stratigraphic section. The most recently deposited materials are the youngest and are always at the top. This concept is known as the **Law of Superposition**. It always applies except when some type of disturbance has occurred.

**Strata** in archaeological sites provide archaeologists with temporal and spatial information. All of the artifacts in a given stratum will be of approximately the same age, while those in strata above or below will be younger or older respectively.

**Cross-dating** can indirectly establish a date for artifacts and sites. Artifacts such as stone points and pottery were made in distinctive styles through time. A modern analogy is automobiles: one would not mistake the style of a car made in the 1920s with one made in 1990. If an arrow point was found in association with a hearth that was radiocarbon dated to be 500 years old, it is assumed that the arrow point is the same age. When that style of arrow point is found at another site, the archaeologist would assign the site and the arrow point an age of approximately 500 years. Often cross-dating is the only method archaeologists have to determine the age of sites.

Most sites represent a single occupation. It is much more rare for a site to contain evidence of repeated occupations. Stratified sites can show culture change over time and have the potential to give clues about the relationship one group of people had to those who came before or after them. Because of their great information potential, and their

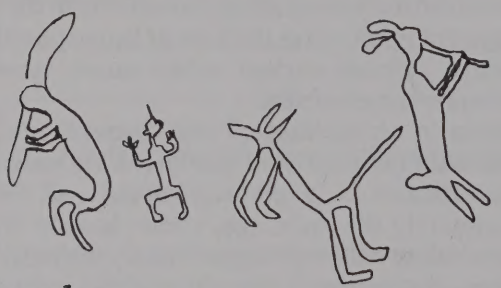
rarity, archaeologists regard stratified sites as particularly important.

When an archaeological site is vandalized or artifacts are removed, knowledge about past cultures is lost forever. Damage to stratigraphy by unauthorized digging destroys the information that could be obtained under controlled scientific excavation. The removal of diagnostic artifacts from a site often removes all possibility of determining the site's age. If you see anyone digging in an archaeological site or taking artifacts, report them to law enforcement authorities.

## Setting the Stage:

Stack five books on a table. Tell the students that the books were placed in their positions one at a time. Ask them which book was placed in position first. Which one was placed last? This illustrates the Law of Superposition.

Now have the students imagine how thick the dust would be on a table if no one dusted it for 100 years. Each book represents a layer of sediment built up in a similar fashion for hundreds or even thousands of years.



## Procedure:

1. Using the "Site Near Richfield" activity sheet as a guide, draw a layer near the bottom of the blackboard. Show how artifacts are deposited as people live on top of the layer. Then a new layer of sediments is deposited on top of that, by natural processes or by another group of people leaving different types of artifacts. This happens several times until the stratigraphy is built up to present-day levels.

2. Distribute the "Site Near Richfield" activity sheets to the students. Have students answer the questions using the information on the stratigraphy drawing.

3. The artifacts on the "Site Near Richfield" activity sheet have been dated based on the age of the stratum in which they are found. If you found similar artifacts elsewhere, would you know approximately how old they are? Yes. This concept is known as **cross-dating**. An artifact type that has been dated in one place can be dated when found elsewhere.

4. Give the "Cross-dating" activity sheet to the students. Ask the students to imagine that Richfield is a town ten miles away from their town. Have them determine the approximate age of the artifacts based on the information from the "Site Near Richfield" activity sheet.

5. Ask the students if they would be able to study the stratigraphy of a site if the strata had already been mixed up by illegal digging. If someone took an arrow point, what kind of information would he or she have removed from the site?



## Closure:

Summarize how archaeologists use stratigraphy and cross-dating to study archaeological sites.

## Evaluation:

The students turn in their activity sheets for evaluation.

## Extension:

Field trip. Examine the stratigraphy of road cuts. Measure and draw the layers on graph paper. Describe the strata by comparing differences in color and texture and other observable characteristics.

## Links:

Section One, Lesson 5: "Chronology: The Time of My Life"

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**Site Near Richfield Activity Sheet Answers**

1. modern Americans
2. settlers
3. ancient farmers
4. early hunters
5. 4
6. 1

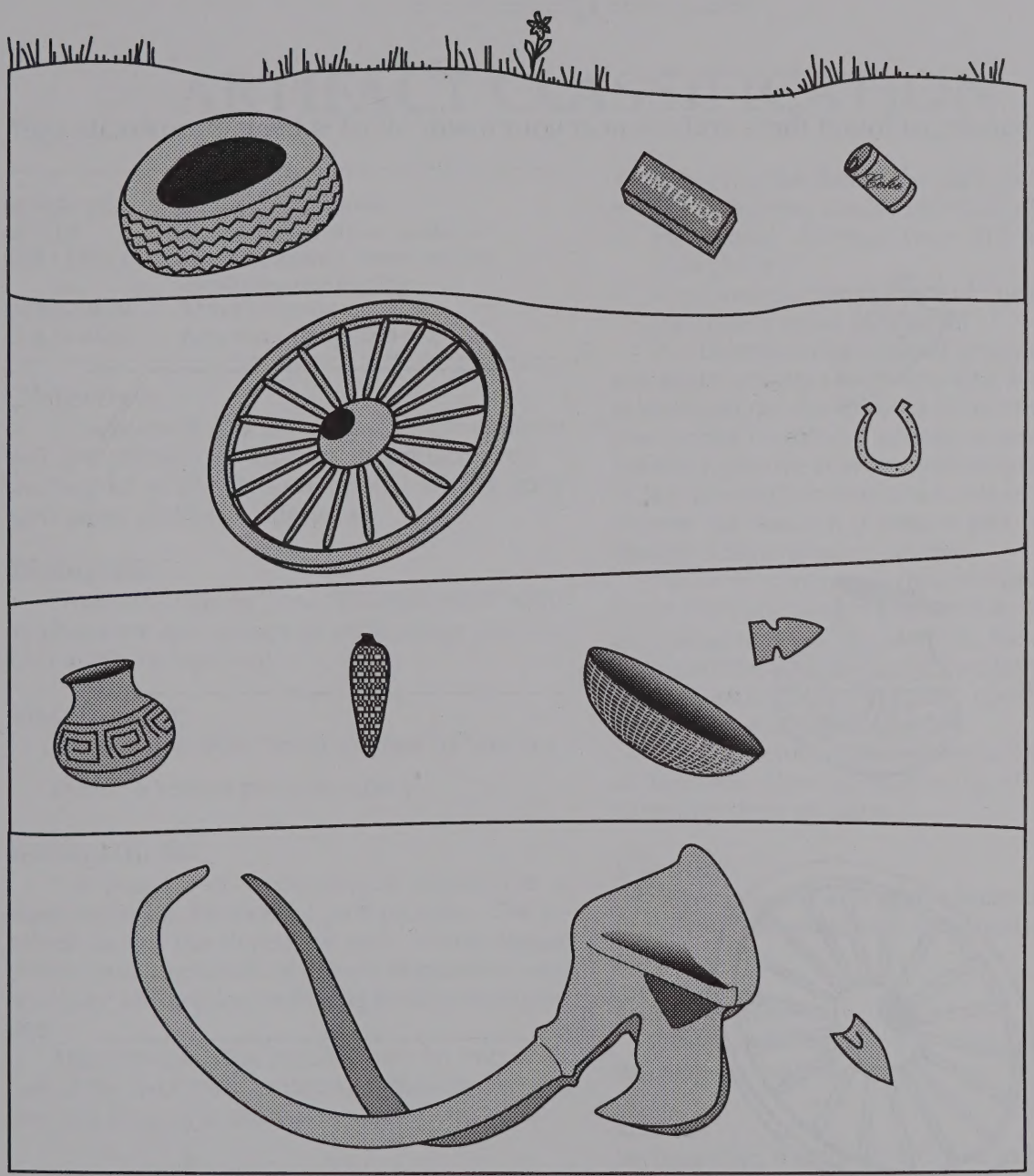
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**Cross-dating Activity Sheet Answers**

1. 10,000 to 12,000 years ago
2. 750 to 1,000 years ago
3. 100 to 150 years ago
4. 750 to 1,000 years ago

## Site Near Richfield

**Name:** _____




**Who left these artifacts?**

1. _____
2. _____
3. _____
4. _____

5. Which people came first? _____

6. Which people came last? _____

## Cross-dating

**Name:** _____

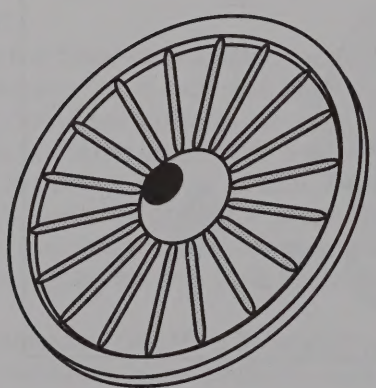
An archaeologist found these artifacts near your town. What is their approximate age?



1. _____



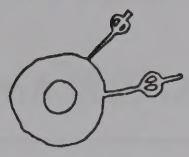
2. _____



3. _____



4. _____



11

# ARTIFACT CLASSIFICATION

| | |
|---|---|
| **SUBJECTS:** | Science, language arts |
| **SKILLS:** | Application, analysis, evaluation |
| **STRATEGIES:** | Scientific inquiry, research skills, classifying, role playing |
| **DURATION:** | 30 to 45 minutes |
| **CLASS SIZE:** | Any; work groups of 4 to 5 |

## Objective:

In their study of artifact classification students will use pictures of artifacts or artifacts from a teaching kit to classify artifacts and answer questions about prehistoric lifeways.

## Materials:

"Ancient Artifacts" and "Classification" activity sheets for each group; an archaeology teaching kit if available (optional).

## Vocabulary:

**artifact**: any object made or used by humans.

**sherd**: a broken piece of pottery.

## Background:

The purpose of archaeological research is to learn about the lifeways of past peoples. The research design developed for each archaeological project usually consists of a series of questions and how they will be answered using the archaeological data.

The artifacts from the site form an important part of the data base. Artifacts are classified so that they can be used to answer research questions.



## Procedure:

1. Tell the students to imagine they are a team of archaeologists. The team has completed excavation of an ancient site in the Southwest. They are now ready to begin analyzing the artifacts brought back to the laboratory to find out about the people who lived at the site. They will use a series of questions to structure their inquiry.

- What was the diet of the site's residents?
- What did they use for personal adornment?
- How many different ways did they decorate their pottery?
- How many different kinds of raw materials did they use to make their tools?

2. Distribute the "Ancient Artifacts" and "Classification" activity sheets. Working individually or in small groups, the students cut out the artifacts on the "Ancient Artifacts" activity sheet. They group the artifacts so they can answer the questions on the "Classification" activity sheet. Have the students answer the research questions and tell how they classified the artifacts to do that.

As the students work they will find that objects move from one category to another depending on the question asked. For example, the two pieces of shell could be used to answer questions concerning diet and adornment. Thus, they could be classified as food remains and as jewelry.

3. Have students create one or more questions of their own. How might they classify their objects to answer these questions?

## Closure:

Summarize what you have learned about classification and answering archaeological research questions.

## Evaluation:

The students hand in the "Classification" activity sheet for evaluation.

## Links:

Section One, Lesson 6: "Classification and Attributes"

Section One, Lesson 7: "Scientific Inquiry"

**Classification Activity Sheet Answers**

1. corn, beans, meat, and shellfish
2. turquoise and shell
3. checkerboard, lines, dots, shapes, and plain
4. bone, stone, plant fibers, shell, and clay

# Ancient Artifacts



## Classification

**Name:** _____

1. What was the diet of the site's residents?

2. What did they use for personal adornment?

3. Describe the different ways they decorated their pottery.

4. Name the different kinds of raw materials they used to make their tools.



12

# ARCHAEOLOGY AND TREE-RING DATING

(Adapted from *Date a Tree*, by Barbara Gronemann, 1986, Southwest Learning Sources and the Arizona Archaeological Council.)

| | |
|---|---|
| **SUBJECTS:** | Science, social studies, mathematics, language arts |
| **SKILLS:** | Knowledge, comprehension, application, analysis, evaluation |
| **STRATEGIES:** | Computation, observation, forecasting, discussion |
| **DURATION:** | 45 to 60 minutes |
| **CLASS SIZE:** | Any |

## Objectives:

In their study of dendrochronology students will use activity sheets and a discussion to:

1. Apply principles of dendrochronology to determine a tree's age and to recognize climatic variation.
2. Analyze and experience how archaeologists use tree rings to accurately date archaeological remains and study past climates.

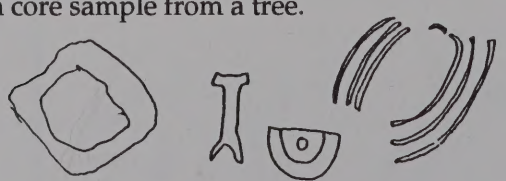
## Materials:

Transparency of the "Master Sequence," "The Stump" and "Be A Dendrochronologist" activity sheets, scissors, glue or Scotch tape, (optional: slices of tree stumps or limbs), and transparency of "Be A Dendrochronologist."

## Vocabulary:

**dendrochronology**: determining the age of a tree by counting its rings; the study of tree-ring dating.

**increment borer**: an instrument used to remove a core sample from a tree.



## Background:

Dendrochronology (den-droh-cruh-NOL-uh-jee), also called tree-ring dating, is based upon the fact that trees grow in width by adding an outer layer, usually one per year. When looking at a cross section of a tree trunk, these yearly layers appear as light and dark rings of varying widths. The layer next to the bark is the most recent yearly growth, and the center of the tree is the first year of growth. One pair of light and dark rings results from one year's growth. The light colored section is the spring and summer growth when the tree has a lot of sap. As the weather cools, and the tree slows its growth rate, the cells become smaller and thicker-walled. Finally, the sap stops flowing and the tree ceases to grow during the winter, forming a smooth dark ring. By counting the **dark rings**, the age of a tree can be known if the cross section of the trunk is complete.

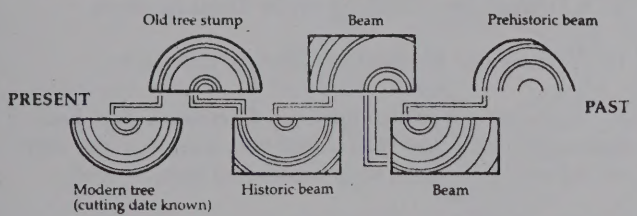
In the arid West, trees seldom have sufficient moisture to grow to their yearly maximum potential. The width of the tree rings varies with the growing conditions of each year. For instance, higher rainfall and a longer growing season produce a wider ring than does a year of low rainfall and prolonged cold. Tree rings can thus tell us about year-to-year climatic conditions in the region in which the tree grows. The tree-ring patterns have been found to never repeat in exactly the same way.

Dendrochronology was first studied in 1904 by Dr. Andrew E. Douglass, an astronomer at the University of Arizona. He was trying to analyze climate, and he soon noticed that the trees showed the same patterns of ring widths, because they had all experienced the same climatic conditions. In order to study climate further back in time, Douglass analyzed wood from prehistoric Indian ruins in the Southwest. He used a "bridging" method to do this.

First, he looked at trees recently cut, so that he knew the exact year that the tree added its last growth ring. By counting inward and subtracting the number of rings from the year the tree was cut, the year that tree started to grow could be calculated.

The cutting year of another piece of wood can be determined by matching its tree-ring pattern with the pattern of a piece of wood whose cutting year is known. Say there was a drought 50 years ago, appearing as a very narrow tree-ring. This narrow tree-ring will appear in all the trees in the area, but at different positions in the stump, because the trees are of different ages. The drought ring may have occurred during one tree's second year of growth, in another's 75th year of growth.

A master sequence is made by drawing vertical lines on a piece of paper at the end of every tree ring. The sequence is a series of parallel lines; the width between each line is the same as the width of each tree ring. By continually matching and recording the ring patterns of older and older pieces of wood, a master sequence of tree-ring patterns is now extended as far back as 8700 years in some places.



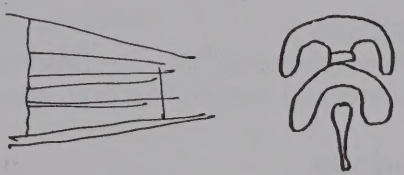

A master sequence of ring patterns is prepared for different regions, since rainfall and temperatures, and hence tree ring widths, vary from place to place. The master sequence is represented on a slip of paper with vertical lines drawn on it, which match tree rings of a known date. The dendrochronologist makes a graph of the ring patterns for the particular piece of wood he or she is studying, then slides it along the master sequence until the patterns match. The cutting date of the piece of wood is now known.

Dendrochronology is particularly valuable to archaeologists since it can tell them very precisely how old a site is. Many ruins still have wood preserved in their walls and roofs, and even charcoal from a burned structure or a cooking fire can sometimes show clear tree-ring patterns. Archaeologists are also very interested in knowing about past climate since it influenced where people lived, what kinds of foods they grew, and what wild plants and animals were available to them.

Rather than remove a beam from an ancient structure, dendrochronologists use an increment borer, a small drill which removes a thin tube of wood from the beam. This borer will leave a hole in the beam that is only about the size of a soda straw. This method of core removal is also used on living trees so that the tree does not have to be cut down.

By studying many pieces of wood from a prehistoric village, archaeologists can learn about such things as the village growth history, remodeling, site abandonment and re-use. When people returned to a village that had been abandoned for several years, they would repair, replace, and sometimes remodel the buildings, using new wood. The year of their return can be read from the tree rings of the new wood.

Wooden beams, building materials, and charcoal provide a wealth of information about past cultures. However, people sometimes destroy this evidence when they visit Indian ruins. Ancient houses have been pulled apart and the beams used in a campfire. Illegal digging in ruins can also move beams and charcoal from their original location, and then archaeologists cannot tell their context. It is very important to our knowledge about the past that we visit sites with care, and not disturb or destroy anything that is there.



## Setting the Stage:

1. Share background information. (Optional: project the "Master Sequence" transparency and explain how the sequence is created.)
2. Using "The Stump" activity sheet or tree cookies, show students how to count tree rings and discuss the basic knowledge that can be learned from the study of tree rings.
3. Complete the activity sheet.

## Procedure:

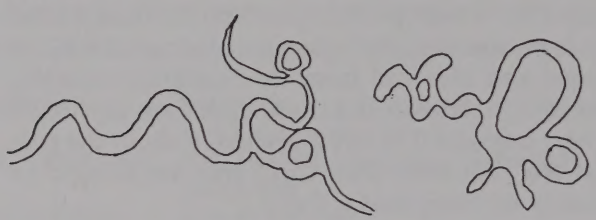
1. If possible, bring in an increment borer and a core sample. Foresters with state and federal agencies might lend these to you. Explain how the borer is used and how the sample can be read, as in "The Stump" activity.
2. Give each student a copy of the "Be a Dendrochronologist" activity sheet. It depicts cross sections of two beams from different archaeological sites. Have students cut out the core samples. The innermost solid line represents the first year's growth. The students match their core samples to the master sequence. Glue the samples from each core onto the master sequence to see how the beams overlap and to date and place them in chronological order. (You may want to demonstrate or work along on the overhead projector.)

3. After students have dated the beams and put them in order, ask them to make some observations about the climate at these sites. What might have been the weather conditions at that time? How would the weather have affected farmers?

4. Share preservation information from the "Background."

## Closure:

Have the students create a summary statement about the importance of tree-ring dating to archaeology. Have them also make a statement about the importance of preserving wood samples in archaeological sites.



## Evaluation:

Students complete "Be a Dendrochronologist" activity sheet and turn it in for evaluation.

## Extensions:

Extension 1. Instead of using "The Stump" activity sheet teachers can use "Tree Cookies," which are polished cross-sections of tree stumps and limbs. Tree Cookies may be available in your area from the U.S. Forest Service or environmental education organizations.

Extension 2. *Project Learning Tree* has an excellent tree ring activity.

## References:

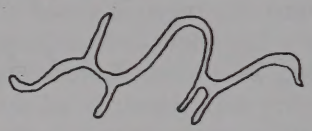
McGregor, John C., 1974, *Southwestern Archaeology*. 2nd ed. University of Illinois Press, Chicago, IL.

Phipps, R.L., and J. McGowan, 1989, "Tree Rings: Timekeepers of the Past." U.S. Geological Survey, Department of the Interior, Denver, CO.

Trefil, James S., 1985, "Concentric Clues From Growth Rings Unlock the Past." *Smithsonian*. July:46-55.

"Tales the Trees Tell," 1977, *National Science Foundation Mosaic* 8(5):2-9.

Western Regional Environmental Education Council and the American Forest Foundation, 1988, *Project Learning Tree*. The American Forest Council, Washington, D.C.



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**The Stump Activity Sheet Answers**

This tree was cut three years ago. Write that year ____.
How old is the tree? 16 years old
What year did the tree start growing? The year it was cut minus 16.
In what year of growth was there the least rainfall? 6
In what year of growth was there the most rainfall? 8

---

**Be A Dendrochronologist Activity Sheet Answers**

1. Climate and the years the site was occupied.

2. It could be skewed. However, if archaeologists find that some beams date well before the others at a site, they would suspect that the early beams had been re-used.

3. Removing beams removes information about the site's date and climate. Moving beams around confuses the record, and archaeologists cannot then tell to which room the dated beam belongs.

4. a. Which beam is the oldest? B
   b. How old was Tree A when it was cut? 14
      Tree B? 13
   c. How many years ago did Tree A start growing? 990 Tree B? 999
   d. How many years ago was Tree A cut? 977
      Tree B? 987

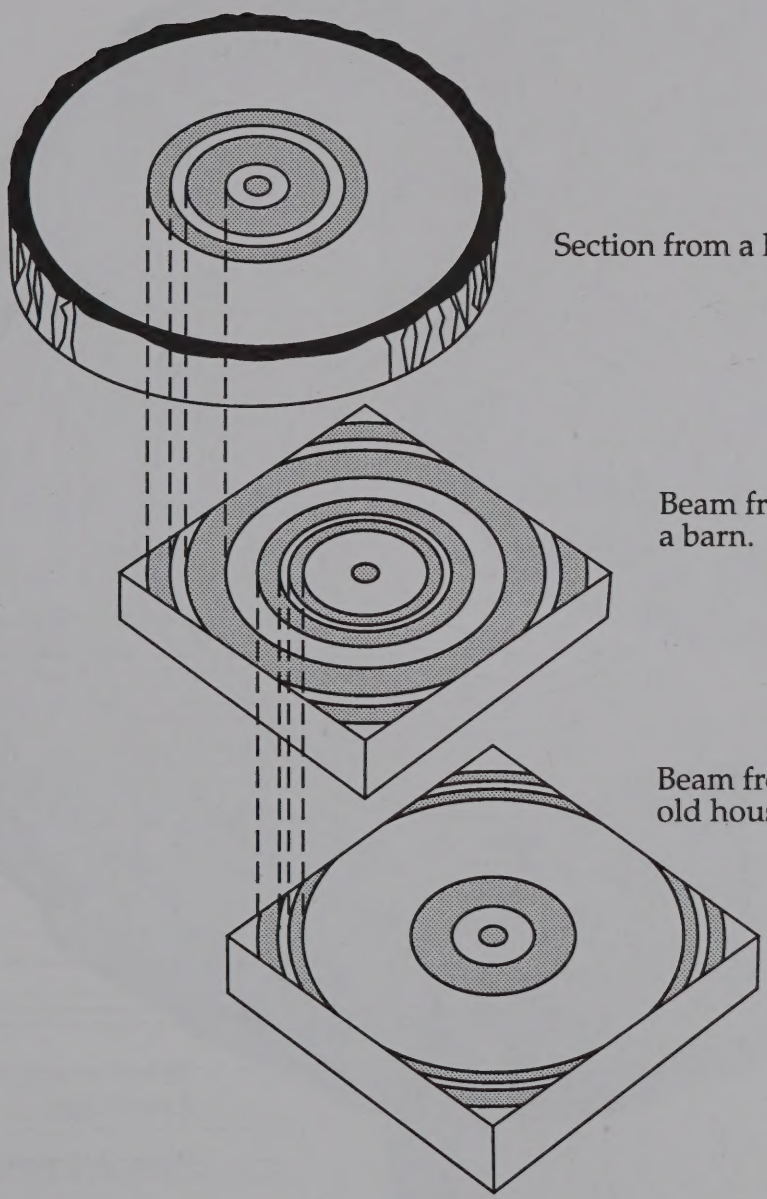
5. Tree A: dry cycles - 0 wet cycles - 2
   Tree B: dry cycles - 2 wet cycles - 2

6. Examples: availability of food and water and other resources might change; survival might depend on adapting to these changes; human populations might change.

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## Master Sequence



Section from a living tree.

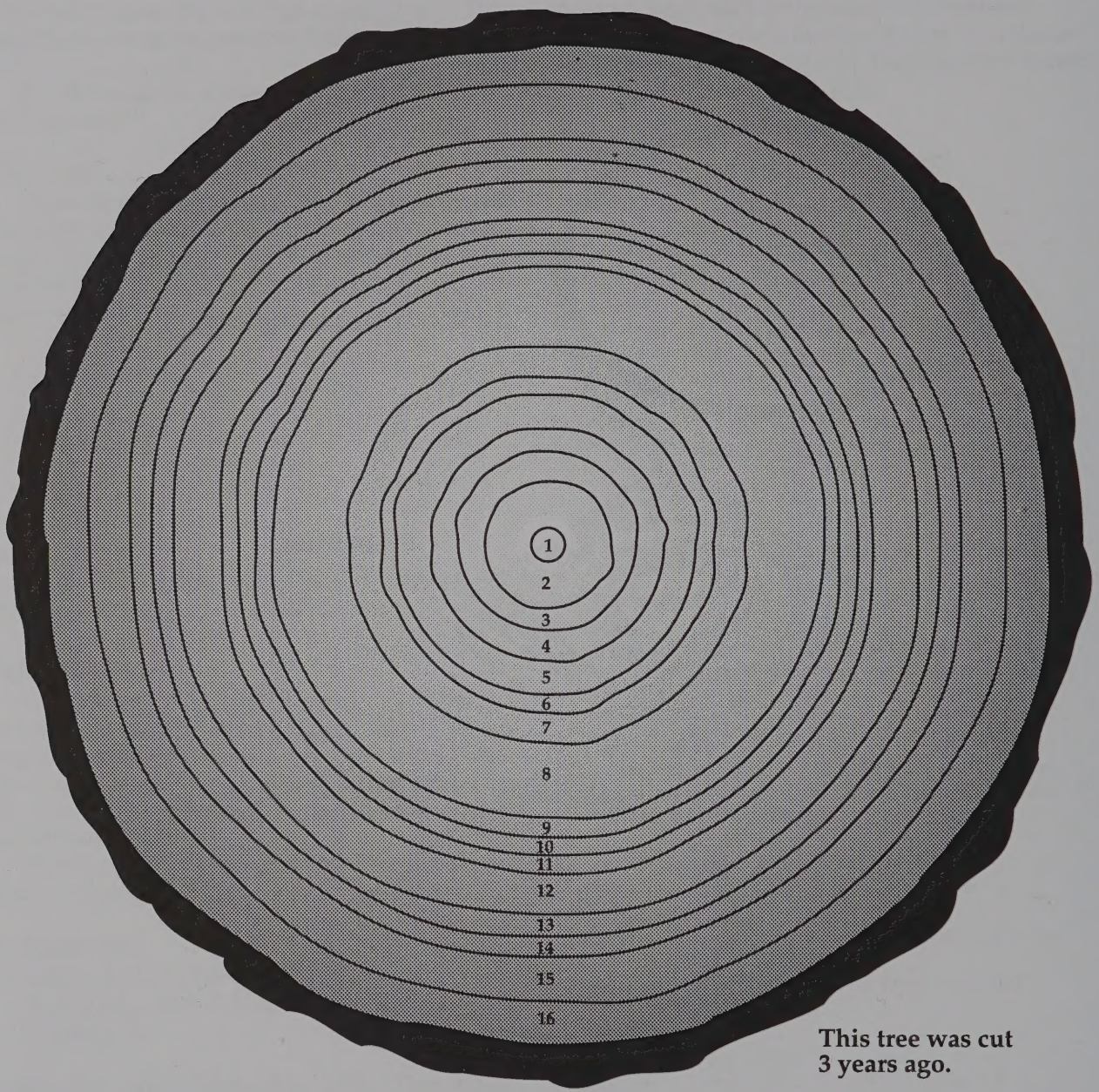
Beam from a barn.

Beam from an old house.

Excerpted from Phipps and McGowan, 1989.

## The Stump

**Name:** _____




**This tree was cut 3 years ago.**

Write that year _____

How old is the tree? _____

What year did the tree start growing? _____

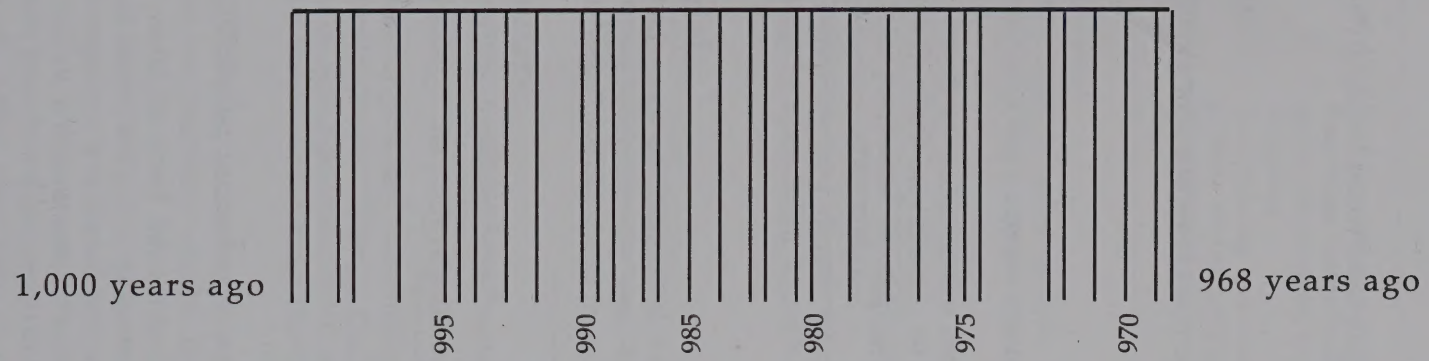
Find the ring that grew the year you were born. Was it a wet or dry year? _____

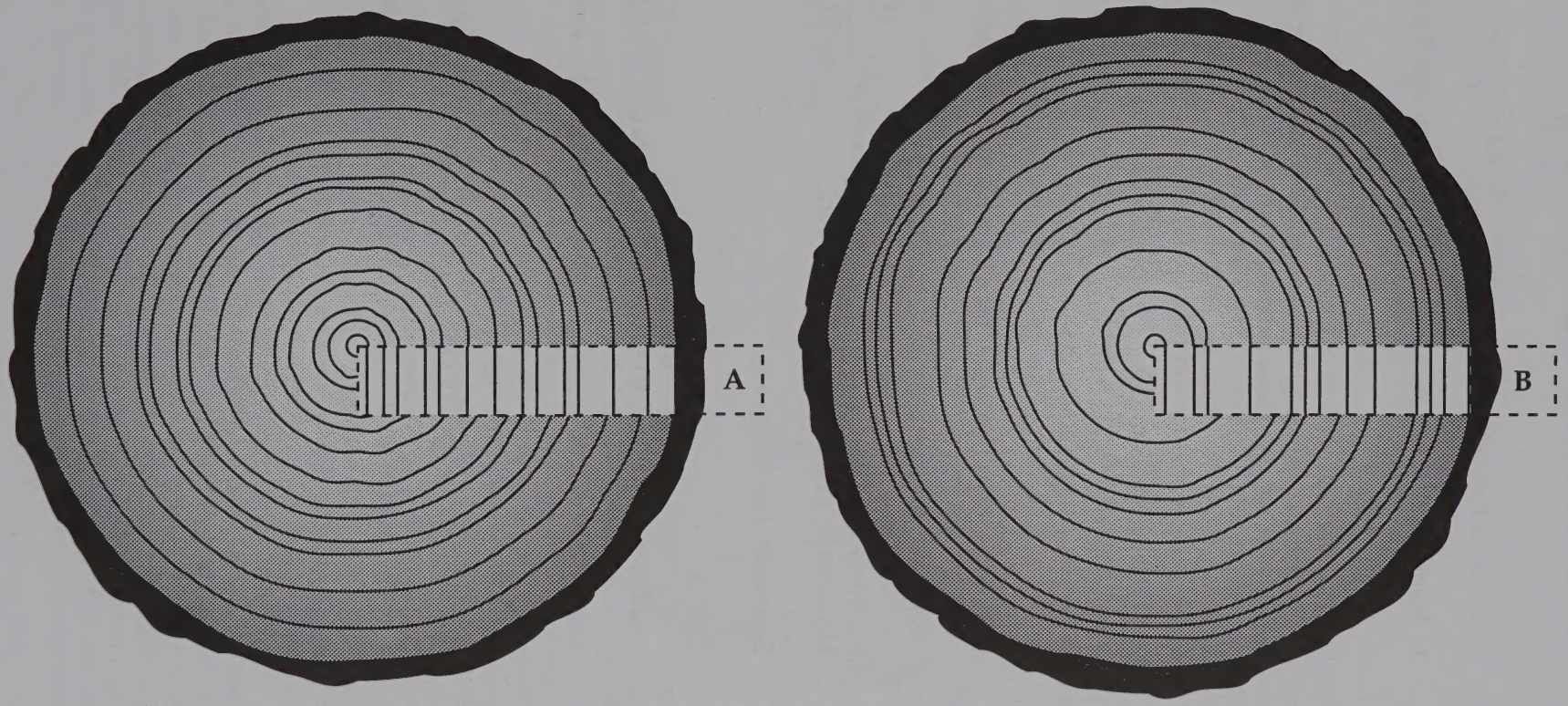
In what year of growth was there the least rainfall? _____

In what year of growth was there the most rainfall? _____

# Be A Dendrochronologist (page 1)

Master Sequence




Taken from Dendrochronology/Tree-rings worksheet © 1986, Barbara Gronemann, Southwest Learning Systems; used with permission.

## Be a Dendrochronologist (page 2) Name: _____

What can a tree tell us?

1. Name two things archaeologists can learn about a site from tree rings.

2. How is the tree-ring record affected if prehistoric people used wood beams from older sites when building new homes?

3. What happens to the archaeological record if someone removes a beam or even places it somewhere else on a site?

4. Refer to Page 1 of your "Be a Dendrochronologist" activity sheets:

Which beam is the oldest? _____
How old was Tree A when it was cut?_____ Tree B?_____
How many years ago did Tree A start growing? _____ Tree B? _____
How many years ago was Tree A cut? _____ Tree B? _____

5. Answer the following:

Tree A:

List the number of dry cycles (two or more dry years) _____

List the number of wet cycles (two or more wet years) _____

Tree B:

List the number of dry cycles (two or more dry years) _____

List the number of wet cycles (two or more wet years) _____

6. How might climatic changes have affected the lifeways of prehistoric people?

13

# POLLEN ANALYSIS

| | |
|---|---|
| **SUBJECTS:** | Science, math, language arts |
| **SKILLS:** | Knowledge, comprehension, application, analysis, synthesis, evaluation |
| **STRATEGIES:** | Brainstorming, forecasting, discussion, problem solving, writing, graph reading |
| **DURATION:** | 45 to 60 minute period |
| **CLASS SIZE:** | Any |

## Objectives:

In their study of pollen analysis, students will use pictures of pollen grains, an activity sheet and a graph to:

1. Identify six pollen grains and the climatic conditions in which they grow.
2. Infer prehistoric climate and plant use by interpreting two pollen samples.
3. Determine how climate affected a prehistoric village by interpreting a graph of pollen frequency through time.

## Materials:

Transparency of "Magnified Pollen Grains" master; "Two Pollen Samples" and "Pollen Change Over 200 Years" activity sheets for each student.

## Vocabulary:

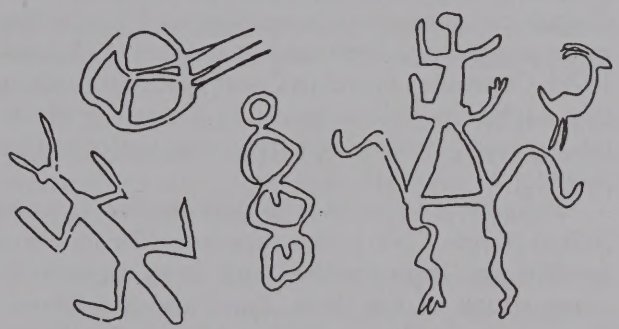
**coprolites**: fossilized feces (human).

**palynology**: the study of pollen grains.

**pollen**: a powdery substance produced by flowering plants. Pollen is the male genetic material, which pollinates (fertilizes) the female part of the flower to produce fertile seeds.

## Background:

Pollen has **four** very valuable features which make it useful for study (Moore and Webb, 1978, p.1). Most importantly, it is **preserved** over enormous timespans if it is buried and maintained in fairly constant environmental conditions. Pollen grains have been found preserved in rock millions of years old. Other plant parts (leaves, flowers, stems) are far less likely to be preserved. Secondly, pollen grains, because of their very **small size**, tend to be carried in air currents. Thirdly, plants produce **great amounts** of pollen. These factors mean that pollen grains are dispersed widely, and it is likely that many of the plants growing in a region will be represented in a pollen sample. Finally, different kinds of plants produce different looking pollen grains. This **distinctiveness** allows identification to (usually) the genus level and, in some cases, to the species level.



Pollen becomes deposited in sediments by settling out of the air onto the ground surface where it becomes buried. Pollen also shows up in areas of a site where people processed plants, such as in hearths and storage rooms. When archaeologists are excavating a site they regularly take pollen samples—small bags of sediment—which are sealed and sent to a palynologist. Pollen is recovered through a laboratory procedure called "pollen extraction," which essentially involves dissolving the sediments and leaving the pollen, which is then placed on a microscope slide. Magnifying the grains 400 to 1000 times, palynologists count and identify the pollen. They are then ready to begin interpreting their results.

Archaeologists use pollen analysis to understand **plant use** and **past climates**. The study of archaeological pollen can tell us if people were growing their own food or relying upon wild plants, or some combination of both. It is possible to learn about past climates because every plant species has specific requirements for temperature and moisture.

Palynologists can infer what the climate had to have been to support the plants represented in the pollen record.

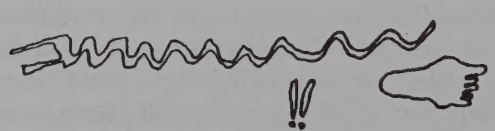
Pollen analysts can help us with modern-day problems, too. For example, the concern about global warming makes it important to understand long term climatic change, so that archaeologists can separate natural climatic cycles from human-caused changes.

Weather patterns on a local level are directly relevant to us as well. Palynologists are finding patterns in long- and short-term droughts in the Southwest. As population there grows and as demands on the water supply increase, such information could be invaluable in planning wise growth.

Pollen has other uses besides providing clues about past climates and past people. Pollen is a very nutritious food, high in protein. Corn pollen is fed to livestock as a dietary supplement, and some people claim pollen has medicinal healing effects (Stanley, 1971). Prehistoric people used pollen as a food. Cattails produce abundant pollen, and Utah's Fremont people apparently used it as a flour ( Madsen, 1979). Coprolites found in Great Basin caves show that Archaic people were eating the pollen of cattails, grasses, cottonwood trees, and various other plants.

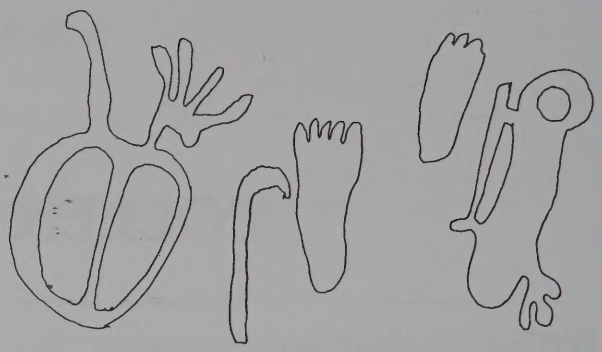
Pollen has a special spiritual meaning to some Indian people. Corn pollen represents the power of fertility and reproduction, and is an element in many rituals of the Hopi, Zuni, and Rio Grande Pueblo people (Waters, 1972, p.162). To the Navajo people, pollen of "corn and other plants is very important in maintaining the proper relationship to the Holy People. In [traditional] households the day still begins with the sprinkling of pollen from one of the little bags and a brief murmured prayer" (Kluckholn and Leighton, 1974, p. 203).

Sites that have been dug up by looters looking for artifacts have lost their potential to tell us about past climates. Looters mix layers from earlier times with those from later times and expose previously sealed layers to contamination with modern pollen. They probably do not even realize they are destroying this fascinating evidence of the past. It is up to everyone to preserve our past. It could mean our future.



## Setting the Stage:

Project the master of "Magnified Pollen Grains," covering the title. Ask the students to guess what they are seeing.



## Procedure:

1. Using the projected master of "Magnified Pollen Grains," review from which plant each grain comes. If possible, bring examples of the plants to the classroom. List on the board what students know about the conditions where that plant typically grows.

**pine**: cool and moist, usually in the mountains
**cattail**: wet, marshy
**sagebrush**: warm and dry, typically in deserts
**corn**: domesticated crop, requires warmth and moisture
**Mormon tea** (ephedra): warm and dry, desert plant
**dandelion**: grows in disturbed areas such as in farm fields and yards; thrives on warmth and moisture

2. Ask students to imagine uses for the listed plants. Supplement their list with the following information about how prehistoric people in the Great Basin used them (from Wheat, 1967, and Fowler, 1986), or research how prehistoric people in your locality used these or other plants.

**pine**: building material, firewood, edible pine nuts
**cattail**: edible roots, flowers, stalks and pollen; leaves used for making rope, mats, bedding, and temporary brush structures
**sagebrush**: medicine, firewood, bark woven into mats and clothing, edible seeds
**corn**: cobs used as fuel, grain eaten fresh or ground into flour, pollen used ritually
**Mormon tea**: edible seeds, foliage used for tea
**dandelion**: edible greens (Note: The dandelion that grows in our yards today is not a native plant. A relative of the dandelion, which grows under similar conditions, is native and was used by prehistoric people.)

3. Present background information about how pollen analysis is done and how archaeologists use pollen analysis to learn about prehistoric environments and plant use.

4. Distribute the "Two Pollen Samples" activity sheet. This is a very simplified version of what

actual pollen samples might look like. Explain that the activity sheet reports the results of two pollen sample analyses: one sample is from a hearth of a 1000-year-old site, and the other sample is taken from outside the site limit at a depth that is the same age as the hearth. (For this exercise, assume that pollen from the hearth got there by direct human action, and that the pollen in the sample from outside the site settled out of the air from the plants growing nearby.)

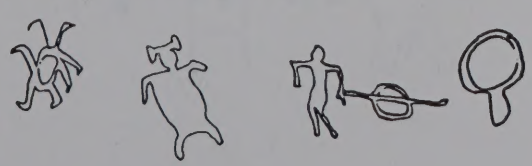
5. Students identify the plants for each pollen grain and write a paragraph interpreting the results from each sample. Examples:

**hearth sample**: people were preparing a meal of corn, dandelion greens and pine nuts. Since corn and nuts are storable and greens are not, we can infer that this meal was being cooked in the spring or summer when dandelion greens are available. Pine nuts must have been gathered far away, based on the results of the other pollen sample. The sample also demonstrates use of wild and domesticated plant food. Alternatively, the pine pollen could have come from firewood instead of pine nuts; the presence or absence of pine nut hulls or pine charcoal from the hearth could clarify which use was occurring.

**outside of site sample**: the site is located in a desert environment, because of the presence of sagebrush and Mormon tea. However, a water source (spring, marsh) must have been very close by, since cattails are present.

6. Distribute the "Pollen Change Over 200 Years" activity sheet. Be sure students understand that the vertical line on the left indicates time and that the graphs show an increase in amounts moving from left to right. Ask them to identify the pollen grains and interpret the graph. Specifically, how was the climate changing over the 200 years, and how did this affect the villagers? An example:

> The climate is cooling and becoming wetter, as shown by the increase of pine pollen. People were growing corn, and along with it in their disturbed fields grew dandelions. Therefore, corn and dandelion increase and decrease together. By 850 years ago the climate appears to have become too cool to grow corn successfully, and people abandoned the site at that time.

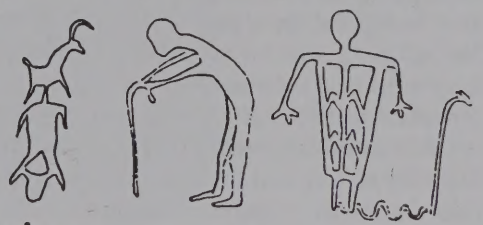


## Closure:

In summary, what two kinds of information can pollen from archaeological sites tell us? Why is it important that sites be left undisturbed if archaeologists are to use pollen analysis to learn about past climates and how people lived?

## Evaluation:

Evaluate students on their identification of the pollen grains and the application of their knowledge to interpreting the pollen sample results.



## Extension:

The following questions enable students to apply their knowledge of pollen analysis to problem solving. Pose the questions either as class discussion topics or as a quiz.

1. If you lived in a northern state, what would you know about the past climate if pollen from an archaeological site 1000 years old showed that coconut palms and pineapples had grown there?

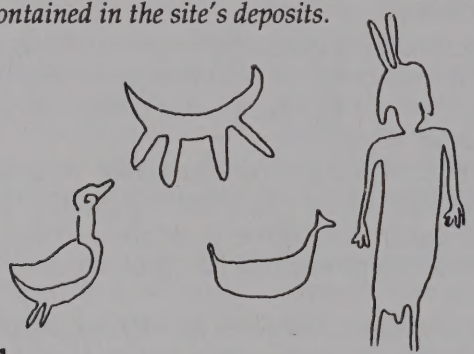
> *The climate must have been warmer and moister than today, with a moderate climate all year round. We know this from examining the climate where coconut palms and pineapples grow today.*

2. A man accused of murder has been caught, but he says he has never been in the forest where the body was found. He claims that he was in the desert at the time of the murder, and he is wearing the same muddy clothes he had on then. He says that he got muddy when trying to remove his truck from a mud hole in a jeep trail. How might you use pollen analysis to discover where he really was?

> *A situation similar to this actually happened. "A man was arrested and charged with the murder of another man while on a journey along the Danube near Vienna; however no body could be found. Pollen analysis of a soil sample from the arrested man's shoes revealed much pine and alder pollen . . . Fortunately, only one area was known along the Danube where pine and alder grew together . . . so the suspect was confronted with this fact. He was so shocked at the deduction that he admitted the crime and the precise location where he had hidden the body"* (Moore and Webb, 1978, p. 7).

3. You know of an ancient well-preserved Indian village near your home. Citizens of your town are trying to decide whether they should build a very expensive reservoir to store water in case of another drought. One evening, you are out for a walk and meet some people who are talking about going up to the Indian village to dig for artifacts. What might you tell them is wrong with doing that? What kind of information important to your town could they be destroying?

*In digging the site, they destroy information about past people and about past climates. It is also against the law to dig sites on public lands. The site could be a storehouse of information about past climates, information which could be very useful to the citizens of the town as they consider the reservoir. They could learn the pattern and duration of droughts in the area over hundreds of years through analyzing pollen contained in the site's deposits.*



## Link:

Section One, Lesson 3: "Observation and Inference"

## References:


Bradley, R.S., 1985, *Quaternary Paleoclimatology*. Allen and Unwin Inc., Boston, MA.

Fowler, Catherine, 1986, "Subsistence." In *Great Basin*, edited by Warren L. D'Azevedo, pp.64-97. Handbook of North American Indians, vol. 11, William G. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Kluckholn, Clyde and Dorthea Leighton, 1974, *The Navajo*. Harvard University Press, Cambridge, MA.

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Moore, P.D., J.A. Webb, 1978, *An Illustrated Guide to Pollen Analysis*. Hodder and Stoughton, London, U.K.

Stanley. Robert G., 1971, "Pollen Chemistry and Tube Growth." In *Pollen Development and Physiology*, edited by J. Heslop-Harrison, pp. 131-155. Butterworth and Co., Toronto, ON.

Waters, Frank, 1972, *Book of the Hopi*. Ballantine Books, New York, NY.

Wheat, Margaret M., 1967, *Survival Arts of the Primitive Paiutes*. University of Nevada Press, Reno, NV.

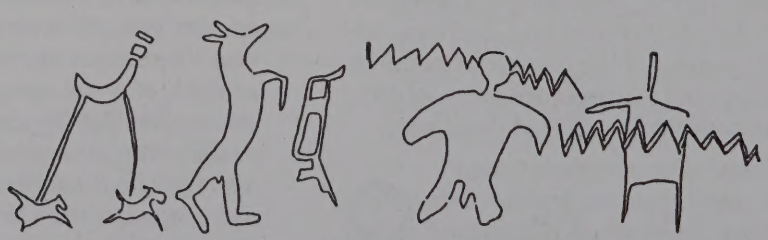



**Two Pollen Samples Activity Sheet Answers**

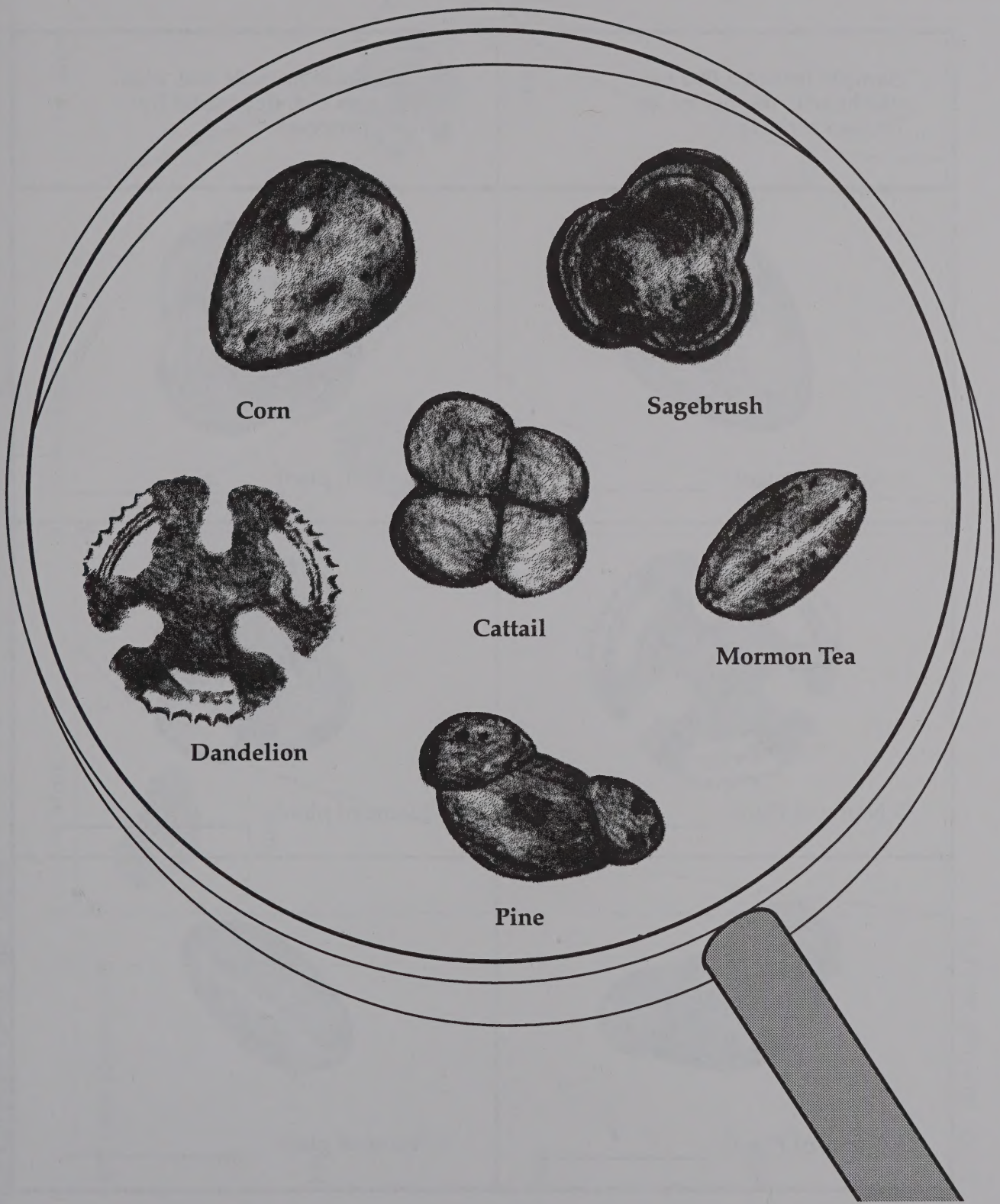
1. corn
2. dandelion
3. pine
4. sagebrush
5. cattail
6. Mormon tea

**Pollen Change Over 200 Years Activity Sheet Answers**

1. pine
2. corn
3. dandelion

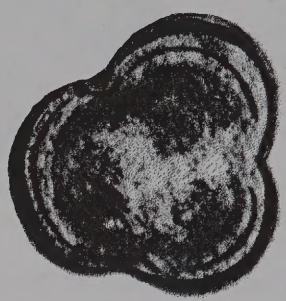


## Magnified Pollen Grains



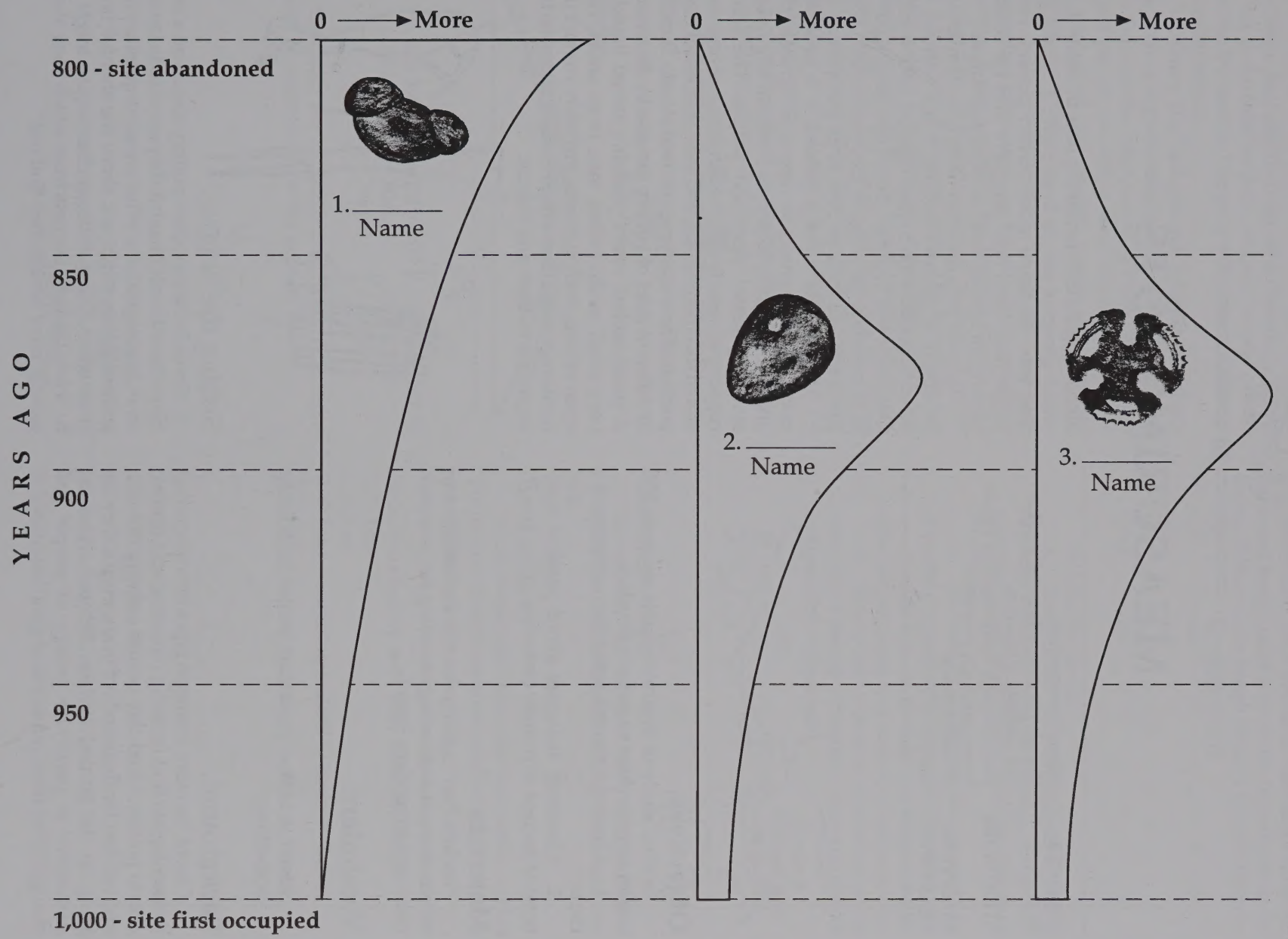
## Two Pollen Samples

**Name:** _____

| **Sample from a 1,000 year old hearth, deposited by human activity** | **Sample from outside site, also 1,000 years old, deposited by natural proceses.** |
|---|---|
|  <br>1. Name of plant _____ |  <br>4. Name of plant _____ |
|  <br>2. Name of Plant _____ |  <br>5. Name of plant _____ |
|  <br>3. Name of Plant _____ |  <br>6. Name of plant _____ |

## Pollen Change Over 200 Years

Name: _____



14

# MEASURING POTS

| | |
|---|---|
| SUBJECTS: | Science, mathematics |
| SKILLS: | Knowledge, comprehension, application, analysis, evaluation |
| STRATEGIES: | Brainstorming, computation of circumference, analogy, discussion |
| DURATION: | 45 to 60 minutes |
| CLASS SIZE: | Any |



## Objectives:

In their study of measuring pots students will use an activity sheet or pottery sherds to:

1. Compute circumference from a section of a circle.
2. Construct analogies about possible functions of ancient or historic ceramics.

## Materials:

"Broken Pots" activity sheet for each student, or sherds from an archaeology teaching kit, or sherds from broken modern vessels.

## Vocabulary:

**sherd**: a piece of broken pottery.

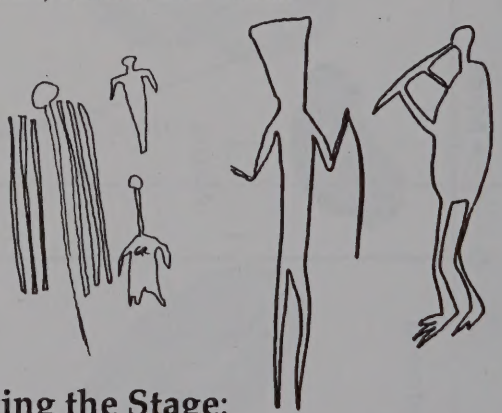
**vessel**: a hollow or concave utensil for holding something.

## Background:

One of the more common types of artifacts that archaeologists find in both prehistoric and historic sites is pottery. Fired clay vessels are very durable, and will last for thousands of years, even if they are lying on the ground surface. Because styles are distinctive to particular groups of people and changed over time, pottery is of great assistance to archaeologists in determining how old a site is, and which group of people lived there. Archaeologists also want to know what certain pottery vessels might have been used for: were they for cooking, serving, or storing food or other substances?

Because pots are most often found broken into hundreds of pieces (sherds), it is a tedious, and often impossible job to glue them all back together. One quick way to get an idea of how large a pot was is to calculate the original circumference. Using a rim sherd will indicate how large the opening was.

If enough of a pot is present, it is possible to calculate its volume, or storage capacity. Many clues about how a group of people lived can be gained by studying vessel sizes and shapes. The storage capacity of vessels allows calculation of how much stored food people had, and from that, estimates are possible of how many people lived at a site. Functions of different sizes of pottery can also be determined. A small-necked vessel probably stored liquids or very small seeds, rather than large seeds. Large open vessels, such as bowls, probably weren't used for storage, since they would be difficult to seal from moisture, rodents and insects.



## Setting the Stage:

Spread some modern pottery sherds on a table. Have the students imagine they are sherds found at an archaeological site. What are some questions that archaeologists might ask about the sherds? Brainstorm ideas. One question archaeologists might ask is: "How big were the pots from which these sherds came?" How would they find out?

## Procedure:

(**Note**: Real sherds from an archaeology teaching kit or broken modern ceramic vessels can be used for this lesson. Use pots with rims of different circumferences.)

1. Share the background information about why archaeologists study prehistoric ceramics and how they use the information to study the lifeways of past people. Include a short discussion on how different sized and shaped vessels are used for different purposes.

2. Calculate the interior circumference of a pot represented by a sherd or the activity sheet sherd drawing. If you are using real pottery sherds, lay a rim sherd finished side down on a sheet of paper and trace around its inner edge. Use either the rim tracing or the first sherd on the activity sheet, and measure a straight line between two points on the curve. Measure the length of that line (C, chord length), calculate its midpoint and then measure the distance from the midpoint to the curve edge (M, middle ordinate).

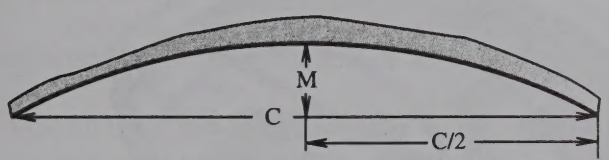
3. The formula to calculate the radius (r) of a circle from a portion of it is:

$$r = C^2/8M$$

The formula to calculate the circumference (c) is:

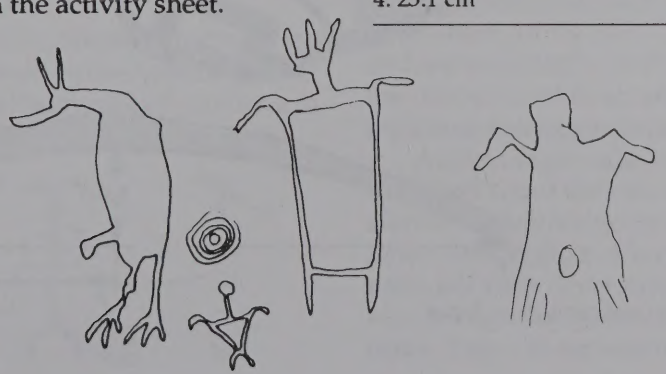
$$c = 2\pi r$$
$$\pi = 3.14$$

Example:




| | | |
|---|---|---|
| C= 7.8 cm | $r = 7.8^2/8$ (1) | c = 2 (3.14) (7.6) |
| M = 1 cm | r = 60.8/8 | c = 2 (23.9) |
| | r = 7.6 cm | c = 47.8 |

Calculate the circumference of the pots represented by each sherd on the activity sheet.



4. The relationship between chord and radius is approximate. The formula is most accurate when the chord length used is small in comparison to the radius. Below is the range of error in calculations:

| C/r | Error (percent) |
|---|---|
| 1/1 | 6.4 |
| 1/2 | 1.6 |
| 1/4 | 0.4 |
| 1/10 | 0.1 |

5. Ask the students:

a. Describe the different shapes and sizes of pottery vessels in your kitchen. Write their descriptions or draw pictures of the vessels on the board.

b. Are vessels of different shapes used for different purposes or occasions? Give examples.

c. Are vessels of different sizes used for different purposes or occasions? Give examples.

d. How might archaeologists interpret the presence of vessels of variable sizes and shapes in an archaeological site?



## Closure:

Summarize the reasons why archaeologists compute the circumference of ancient pottery vessels.

## Evaluation:

Students calculate the circumference for each of the pots on the activity sheet, and turn in their work for evaluation.

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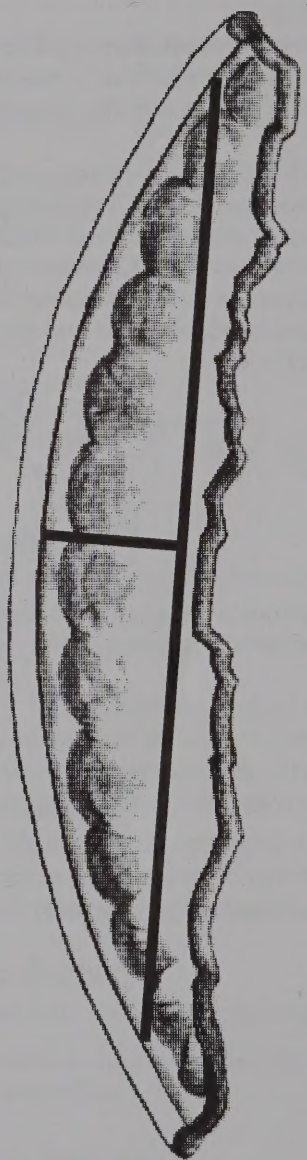
Broken Pots Activity Sheet Answers (approximate)

1. 75.3 cm
2. 15.7 cm
3. 10.7 cm
4. 25.1 cm

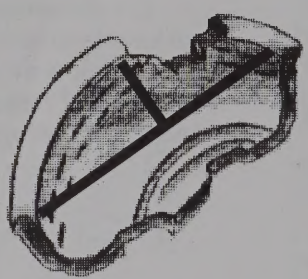
## Broken Pots

**Name:** _____

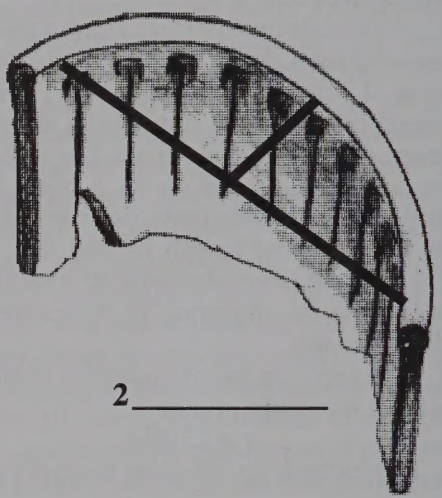
Find the circumference of the pots represented by the sherds below.



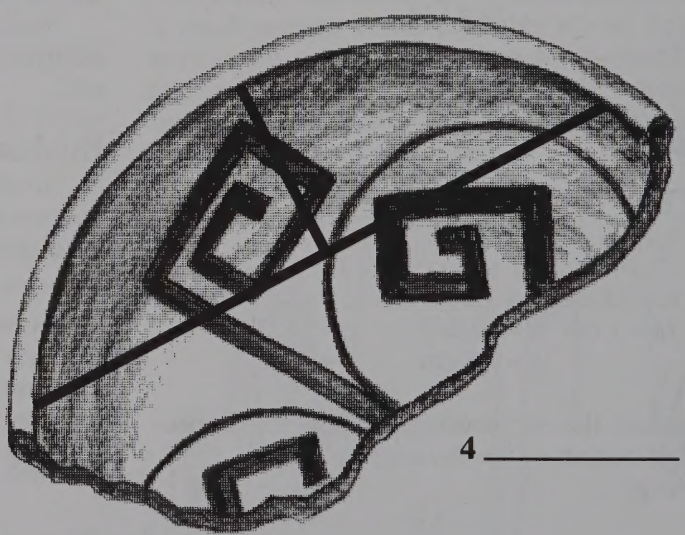
1 _____



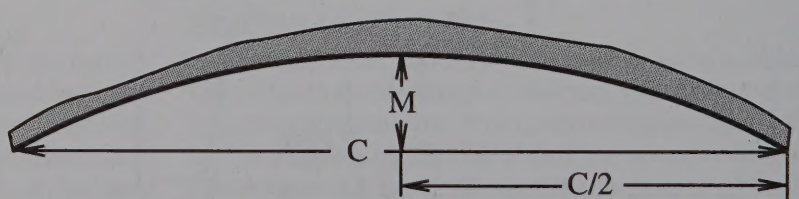
3 _____



2 _____



4 _____




$r = C^2/8M$ Circumference $= 2 \pi r$



15

# ARCHAEOLOGY AND ETHNOGRAPHIC ANALOGY: THE ANASAZI AND THE HOPI

| | |
|---|---|
| **SUBJECTS:** | Science, social studies, language arts |
| **SKILLS:** | Analysis, synthesis, evaluation |
| **STRATEGIES:** | Role play, reading, map reading, analogy |
| **DURATION:** | 45 to 60 minutes |
| **CLASS SIZE:** | Any; work groups of 2 |

## Objectives:

In their study of ethnographic analogy students will use an ethnography and an archaeological site map to:

1. Infer the use of ancient Anasazi artifacts based on the Hopi's use of similar items.
2. Explain why archaeologists use ethnographic analogy.

## Materials:

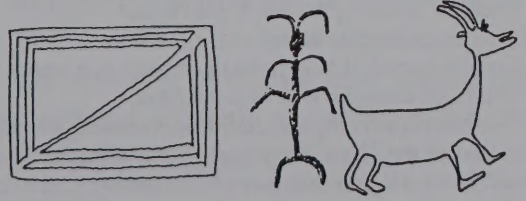
"Flatrock Ruin" activity sheet and the Hopi ethnography for each student or team.

## Vocabulary:

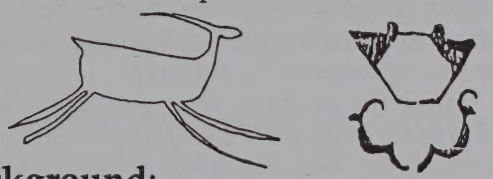
**ethnographic analogy**: inferring the use or meaning of an ancient site or artifact based on observations and accounts of its use by living people.

**ethnography**: description of a culture based on observation of and interaction with living people.

**kiva:** usually an underground structure, for ceremonial use. First built by the Anasazi people; Hopi and Rio Grande Pueblo people continue to build and use kivas today.



**myth**: usually a traditional story of presumably historical events that serves to unfold part of a world view of a people or explain a practice, belief, or natural phenomenon.



## Background:

Cultural anthropologists write ethnographies or descriptions of the people that they study. An ethnography usually includes information on the kinship system, subsistence activities, religion, and many other aspects of the culture. Sometimes ethnographies tell how certain artifacts or buildings were used. Archaeologists often use ethnographic information to help them interpret how artifacts and sites might have been used by ancient people. For example, circular subterranean structures in ancient Anasazi sites are interpreted to be kivas, similar to those constructed by the modern Hopi in northern Arizona.

While ethnographic information does not provide direct proof of the function of archaeological materials, it offers invaluable assistance in determining how certain artifacts and structures may have been used by their makers. If an archaeologist is studying sites in a region, he or she could use ethnographic information about the peoples who lived there at the time of Euro-American contact and were studied by anthropologists. Knowing how the people lived in an area could help in interpreting the archaeological sites located in the same area.

Archaeologists also use historic photographs to find clues about the uses of artifacts and features. In addition, many historic travelers, such as Meriwether Lewis and William Clark or John Wesley Powell, recorded their observations of native life before it was changed by contact with Euro-American cultures. These observations also provide important

clues to archaeologists in interpreting artifacts and archaeological sites.

## Setting the Stage:

Share the background information with the students.



## Procedure:

1. Have students form teams of two. Distribute copies of the activity sheet to each team and have them imagine they are archaeologists studying the site represented by the map.
2. Have the students read the ethnography and fill in the activity sheet using the information in the ethnography. For example, to determine how the Anasazi used a kiva, they locate where kivas are discussed and write the interpretation in the blank.
3. Ask the students: What were you able to learn about the archaeological site using the ethnography of the Hopi? Were you able to find out how the Anasazi inhabitants must have met some of their basic needs? Which ones? (food—piki bread, corn; explanation—kiva, sipapu, kachinas, the sacredness of corn)
4. How might you check the validity of your interpretations? Additional archaeological information might strengthen conclusions based on ethnographic information. For example, if you thought that the flat rock was used for making piki bread, you might examine it for traces of cornmeal or pollen. Such evidence may indicate that the rock was used for cooking.

## Closure:

Give reasons why ethnographic information is helpful in interpreting archaeological sites.

## Evaluation:

The students turn in their activity sheets for evaluation.

## Links:

Section One, Lesson 2: "Culture Everywhere"

## References:

Adams, E. Charles, 1991, *The Origin and Development of the Pueblo Katsina Cult.* University of Arizona Press, Tucson, AZ.

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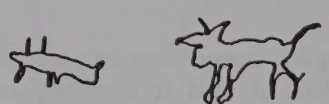
O'Kane, Walter Collins, 1974, *Sun in the Sky: The Hopi Indians of the Arizona Mesa Lands.* University of Oklahoma Press, Norman, OK.

Powell, John Wesley, 1972, *The Hopi Villages: The Ancient Province of Tusayan.* Filter Press, Palmer Lake, CO.

Smith, Watson, 1952, *Kiva Mural Decorations at Awatovi and Kawaika-a, with a Survey of Other Wall Paintings in the Pueblo Southwest.* Papers of the Peabody Museum of American Archaeology and Ethnology, Vol 37. Harvard University Press, Cambridge, MA.

Waters, Frank, 1978, *Book of the Hopi.* Reprinted. Penguin Books, New York. Originally published 1963, Viking Press, New York, NY.

Williamson, Darcy and Lisa Railsback, 1987, *Cooking with Spirit: North American Indian Food and Fact.* Maverick Publications, Bend, OR.



**Flatrock Ruin Activity Sheet Answers**

1. A round ceremonial structure
2. May symbolize where the first people came onto the earth.
3. Used for cooking, probably piki bread
4. Used to make piki bread
5. Corn is sacred, it may have been used in a ceremony.
6. The Hopi consider it to be a Kachina.
7. They were probably farmers. Their housing was similar to that of the Hopi. They probably made piki bread to eat. Their religion may have been similar to that of the Hopi.

# THE HOPI OF NORTHERN ARIZONA

## Hopi—Descendants of the Anasazi

The Hopi people of Northern Arizona recognize themselves as descendants of the Anasazi Indians. "Hopi" means "peaceful people." The Anasazi lived in the Four-corners region from about 1500 to 700 years ago when they abandoned their cliff dwelling homes and moved southward to the Rio Grande River drainage and the Hopi Mesas. Why they moved is not understood.

Modern Hopi people have many of the same cultural characteristics that archaeologists have recorded about the Anasazi. For example, the Hopi live in adobe structures on top of mesas and build round ceremonial structures called kivas. The Anasazi made their homes out of adobe and also built kivas. The Hopi are masters of dry farming (growing food without extensive irrigation), and they cultivate corn, beans and squash. These foods were also grown by the Anasazi in much the same way.

## Corn—A Way of Life for the Hopi

Corn is very sacred to the Hopi people. Traditionally, their survival depended on corn. Pollination and moisture are important for the growth of this lifeblood food, and pollen and rain are very sacred to the Hopi. They grow four different colors of corn—blue, white, yellow and red—representing the four cardinal directions. Blessings, dances and ceremonies are offered to corn, and it is eaten with almost every meal. A Hopi baby is named during a ceremony in which he or she is given a first taste of corn mush.

Hopis make a special food of corn called piki bread. It is made for special occasions and for ceremonies. "In every house there is a little oven made of a flat stone eighteen or twenty inches square, raised four or five inches from the floor, and beneath this a little fire is built. When the oven is hot and the dough is mixed in a little vessel of pottery, the good woman plunges her hand in the mixture and rapidly smears the broad surface of the furnace rock with a thin coating of the paste. In a few moments the film of the batter is baked; when taken up it looks like a sheet of paper. This she folds and places on a tray. Having made several sheets of this bread from the batter of one color and placed them on the tray, she takes the batter of another color and, in this way makes seven sheets of each of the several colors of corn batter" (Powell, 1972, p.20).

A traditional recipe for piki bread:

1 cup green juniper ash
1 cup boiling water
3 cups water
1 cup blue cornmeal
Sunflower oil for greasing stone

Mix ash with boiling water. Strain juniper ash into a pot. Stir. Add blue cornmeal and water. Stir with a wooden spoon or stick. Let cool. Spread on hot, greased griddle or stone with palm of hand. Be certain the layer is very thin. Cook for a very short time. Carefully, lift paper-thin layer from the griddle by rolling from one end to the other, jelly roll fashion (Williamson and Railsback, 1987, pp. 46-47).

Blue corn and pinyon pine nuts are two other Hopi foods. Try blue corn chips, blue popcorn, or pinyon pine nuts as examples of Hopi foods.

## Hopi Kachinas

Kachinas hold great importance in the Hopi religion. "Kachina can mean three things: the spirit the Hopi believe in, a masked dancer which embodies the kachina spirit, and a carved doll, painted in the spirit's likeness. Kachinas can take many forms—ogres, animals, birds, or clowns. Mudheads are the best known Hopi clowns" (Billard, 1974, p. 181).

Researchers believe the Kachina cult developed after the Anasazi moved southward (Adams, 1991, p. 186). However, some modern Kachinas can be traced to an earlier time. Kokopelli, the hump-backed flute player, is found in early Anasazi rock art. The figure has been found carved into the floors of at least two kivas in southwestern Colorado.

Hopis believe that the kachina spirits live with them for six months of the year. At the end of their stay, the kachina spirits are sent back to their home on the San Francisco Peaks with a grand ceremony called the Niman or "home" dance. "It is on these peaks where the kachinas are believed to feast on plump squash and melons and gather their ceremonial needs for six more months of the year. A Hopi with a pure heart may someday join his ancestors on the snowy peaks" (Billard, 1974, p. 179).



Hopi design

## A Hopi Kachina Song

"In May, corn planting time, the Kachinas wear masks painted with rainbows, and they sing a song about butterflies flying over the corn and bean fields. One butterfly is flying after another, like a hunt, and there are many butterfly pairs. Even as the Hopis paint their faces for a ceremonial dance, so have the butterflies painted themselves with pollen for their flight over the corn blossoms.

The butterflies must go through many flowers, say the Hopi, to make themselves so pretty" (Williamson and Railsback, 1987, p. 47).

**Korosta Kachina Song**
Yellow Butterflies,
Over the Blossoming Virgin Corn,
With Pollen-Painted Faces
Chase One Another In Brilliant Throng
Blue Butterflies,
Over the Blooming Virgin Beans,
With Pollen Painted Faces
Chase One Another in Brilliant Streams.
Over the Blooming Corn,
Over the Virgin Corn,
Wild Bees Hum.
Over the Blooming Virgin Beans,
Over the Virgin Corn,
Wild Bees Hum.
Over the Field of Growing Corn,
All Day Shall Hang the Thunder Cloud;
Over Your Field of Growing Corn
All Day Shall Come the Rushing Rain.



Hopi design

## Hopi Ways

John Wesley Powell, an early explorer and scientist, visited the Hopi Mesas in 1870. He observed:

> In the early history of this country, before the advent of the Spaniards, these people raised cotton, and from it made their clothing; but between the years 1540 and 1600 they were supplied with sheep, and now the greater part of their clothing is made of wool, though all their priestly [clothing], their wedding and burying garments, are still made of cotton.
>
> Men wear moccasins, leggings, shirts and blankets; the women, moccasins, with long tops, short petticoats dyed black, sometimes with a red border below, and a small blanket or shawl thrown over the body so as to pass over the right shoulder and under the left arm. A long [belt] of many bright colors is wound around the waist. The outer garment is also black. The women have beautiful, black glossy hair, which they take great pains in dressing. Early in



the morning, immediately after breakfast, if the weather is pleasant, the women all repair to the tops of the house, taking with them little vases of water, and wash, comb, and braid one another's hair. It is washed in a [mixture] of the soap plant, a species of yucca, and then allowed to dry in the open air. The married ladies have their hair braided and rolled in a knot at the back of the head, but the maidens have it parted along the middle line above, and each lock carefully braided, or twisted and rolled into a coil supported by little wooden pins so as to cover each ear, giving them a very fantastic appearance.

I have already said that the people are hospitable; they are also very polite. If you meet them out in their fields, they salute you with a greeting which seems to mean "May the birds sing happy songs in your fields." They have many other greetings for special occasions. Do one a favor and he thanks you; if a man, he says, "Kwa kwa"; if a woman, "Es-ka-li." And this leads me to say that there is a very interesting feature in their language . . . many words are exclusively used by men, others by women. "Father," as spoken by a girl, is one word; spoken by a boy it is another; and nothing is more vulgar than a man to use a woman's word, or a woman a man's (Powell, 1972, pp. 21-22).

## A Hopi Origin Myth

The Hopi believe that the first people lived underground and then moved up onto the earth, coming through a hole they call a sipapu (SEE-pa-pu). Both the Hopi and the Anasazi include a sipapu as part of their kiva. The sipapu is a small hole in the floor, and is always located behind the fire pit on the north side of the kiva.

The story of the Hopi myth is told by Reynold Nash, a Hopi boy:

The Hopi people came up from a hole in the ground. When they die, they go back into the hole to another world.

The first world of the Hopi Indians was a bad place. The god who made the world said he would make a second world. He told Spider Woman that she should lead the people to a second world.

She showed them the way and when they got there they started planting and building homes, but things were not good. There was a lot of killing going on and there was no game to hunt. Spider Woman went to the god and told him what was happening. He said he would make a third world and that Spider Woman would lead the people again.

In the third world there was no killing and for a while there was enough game. The people tried to plant food but the plants could not grow because there was no light or heat.

The god told Spider Woman to build bonfires around the field. The fire gave some heat and light and the people built fires every day. That way they were able to make things grow. But still that dark world was not good. People were dying. Again Spider Woman went to tell the god what was happening.

He said he would make the fourth world. It would be the last one he was going to make, he said.

He said he would make the fourth world. It would be the last one he was going to make, he said.

The Hopi people came up into the light. They found good land to plant. They lived high up on the mesas where they were safe from their enemies, the Navajos and Utes and other tribes.

Now there are roads leading up to the thirteen Hopi villages, the same roads that used to be trails made by the first Hopis. The Hopis still have the same shrines their ancestors had.

The Hopi people have a good life. They grow their crops in peace. The men make kachina dolls out of cottonwood and the women make baskets out of yucca and pottery out of clay.

The Hopis are still in the fourth world. They thank the god and Spider Woman by taking prayer feathers to the shrines.
The Hopis enjoy staying in the fourth world. (Baylor, 1976, pp. 26-28)

## The Hopi Today

The Hopi today are exquisite potters, basketmakers, carvers, weavers, and silversmiths. Many Hopi still live by their old traditions and ways, and some have adopted the ways of modern life. These two ways of living can cause many problems for the Hopi. Some of the challenges the Hopi face today revolve around land use, energy and mineral development, and social and health problems.

If you enjoyed this story you might want to read *The Village of Blue Stone* by Stephen Trimble or *The Pueblo* by Charlotte and David Yue.

## References

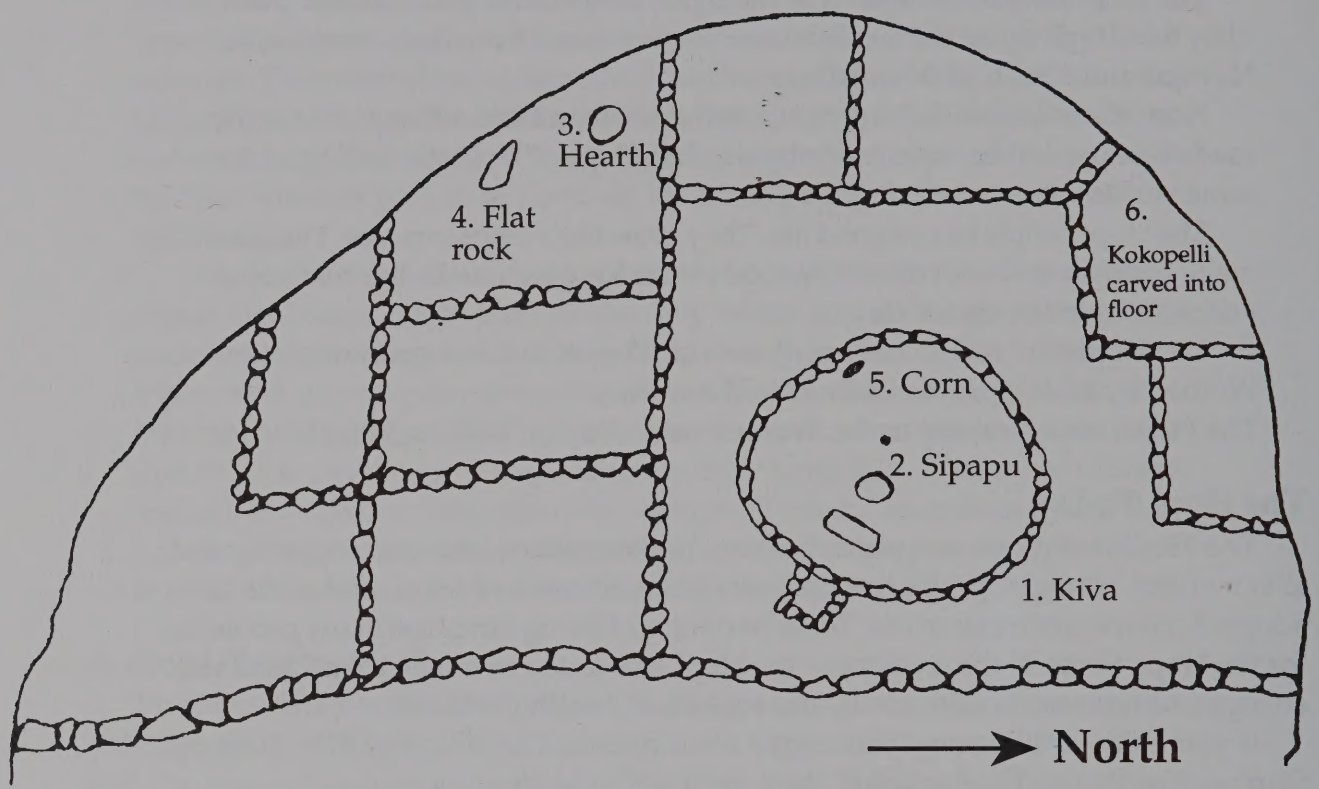
Trimble, Stephen, *The Village of Blue Stone.* Macmillan Publishing Company, New York, NY.

Yue, David and Charlotte Yue, 1986, *The Pueblo.* Houghton Mifflin Publishing Company, Boston, MA.



## Flatrock Ruin

**Name:** _____




**How the Hopi used it.**

1. Kiva _____
2. Sipapu _____
3. Hearth _____
4. Flat rock _____
5. Corn _____
6. Kokopelli carving _____

_____

7. Based on the archaeological and ethnographic evidence, describe how the Anasazi lived at this site.

_____

_____

_____

_____

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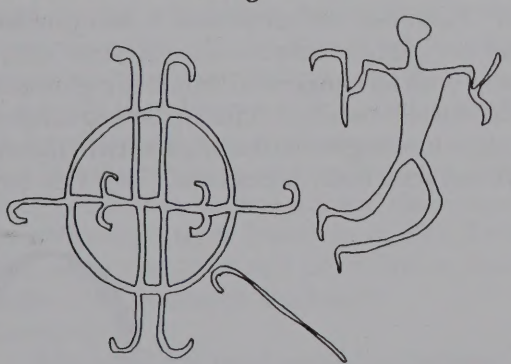
# EXPERIMENTAL ARCHAEOLOGY: MAKING CORDAGE

| | |
|---|---|
| **SUBJECTS:** | Science, social studies, mathematics, language arts, art |
| **SKILLS:** | Knowledge, comprehension, application, analysis, synthesis, evaluation |
| **STRATEGIES:** | Reading, discussion, computation, scientific inquiry, brainstorming, experimentation, writing, invention |
| **DURATION:** | One to two 45 minute class periods |
| **CLASS SIZE:** | Any; work groups of 4 to 5 |

## Objectives:

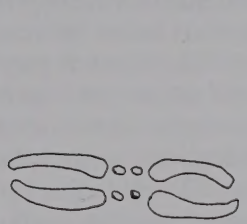
In their study of experimental archaeology students will make cordage and use an activity sheet to:

1. Experience a technique and skill prehistoric peoples needed for everyday life.
2. Compute the amount of time and materials that might have been required to make cordage in prehistoric times.
3. Construct a scientific inquiry to study the contents of an archaeological site.



## Materials:

One spool of hemp rope (about 1/2 inch in diameter). Milkweed or dogbane plant stalks and sagebrush or juniper bark. (If you cannot obtain these native plant fibers, cotton string, raffia, woolen yarn, or other purchased string can be used; some craft stores sell a variety of suitable basketry fibers.) Transparency of the "Experimental Archaeology" activity sheet and a copy for each student or team.





## Vocabulary:

**cordage**: several strands of fiber twisted together; string or rope.

**experimental archaeology**: scientific studies designed to discover processes that produced and/or modified artifacts and structures that are found in archaeological sites.

**fiber**: a slender threadlike strand or string. Bast fibers are the long fibers from a plant stalk.

**Paiute**: an Indian tribe whose traditional territory included the Great Basin of California, Nevada, Oregon, Utah, and Idaho.

**replication**: the act or process of reproducing artifacts, structures, and use patterns.

**sinew**: animal tendon prepared to use as cord or thread.

**technology**: the technique or means for making or doing something, often associated with tool making.

## Background:

Archaeologists cannot ask prehistoric peoples how they made their tools nor can they observe the manufacture and use of artifacts. Thus they must find other means to learn about past technological systems. Experimental replication of artifacts, structures, and wear patterns is one method. Experiments provide possible interpretations and a basis for further study but do not directly prove how artifacts were used or made.

Experimental archaeologists replicate artifacts using techniques that may have been used by ancient peoples. These studies help them to better understand the processes that produced the artifacts and structures found in archaeological sites. Replication studies include the reproduction of stone tools, basketry, ceramics, and cordage. By making these artifacts using prehistoric techniques, archaeologists can address numerous questions about how people lived in the past. Examples include: How long would it take to make a projectile point? Are some raw materials better for stone tool manufacture than others? What kind of clay is the best for ceramic vessels and where can it be found? How long would it take to make a small snare?

Experimental archaeologists also study how artifacts were used in the past. They do this by using them in ways that produce wear or damage patterns similar to those observed on artifacts. For example, archaeologists have used stone tools to butcher zoo elephants that have died in order to learn how Paleo-Indians may have butchered mammoths. They examine the wear patterns resulting on stone tools as well as the cut marks on the bones of the butchered animal. The results of their studies are used to make inferences about how prehistoric peoples may have performed similar tasks.

In this lesson students will make cordage using native plant fibers. Cordage artifacts are commonly found in dry cave sites throughout the western United States and vary in size from tiny fragments to a net measuring 140 feet by 4 feet found at Hogup Cave in northwestern Utah (Aikens, 1970, p.125). Cordage was made prehistorically from a variety of materials including the bast fibers of milkweed and dogbane, yucca leaf fibers, and juniper and sagebrush bark. Human hair and animal sinew were also used. Finished cordage varied in size from 1 millimeter to several millimeters in diameter. Relative size may have been determined by the fibers selected and the intended purpose of the finished object. Experimental archaeologists produce cordage to learn how it was made, the characteristics of the finished pieces, and how much time was required to make these important artifacts.

## Setting the Stage:

1. Distribute a piece of 2-ply twine about 12" long to each student. Ask them if they can determine how the twine was made.

2. The techniques that were used to make many prehistoric artifacts are unknown today. Thus, archaeologists are confronted with problems similar to what the students just experienced with the twine. To better understand how the artifacts were made and used archaeologists must sometimes learn prehistoric manufacturing techniques, occasionally by trial and error. This is called experimental archaeology.

3. Share the Background information.

## Procedure:

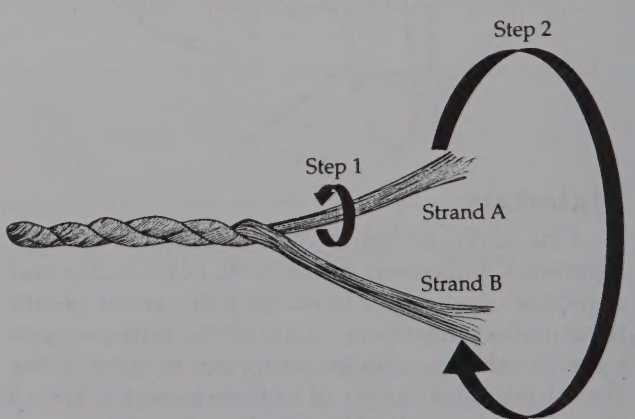
1. The students read "The Paiutes Tie Their World Together." Briefly discuss the importance of natural resources to the Paiute and their prehistoric ancestors.

2. Demonstrate how to make cordage with the commercial hemp fibers (steps 5–7 below); then divide the class into groups of 4 to 5 students. Give each student about 15" of fibers. Assist each group, asking students who readily learned the procedure to help other students.

3. To prepare the fibers, cut the purchased rope into 15" sections. Untwist the rope and pull the fibers straight. If using natural fibers, cut year-old dead stalks of milkweed or dogbane. Carefully break open the stalks and strip the fiber away. Gather the loose pieces of juniper or sagebrush bark from the woody portion of the plants. The removal of small pieces will not damage the plants. Use these natural fibers in the same way as the purchased rope.

4. To make cordage, first rub the hemp, bast fibers, or bark between both palms to remove debris. Separate two long strands of several fibers each from the 15" rope or plant section, starting from one end.

5. Hold one end of Strand A and one end of Strand B together, side-by-side, in your left hand between your forefinger and thumb (if right-handed, *vice-versa* if left-handed). Pick up Strand A between your right forefinger and thumb, and twirl the strand *away* from your body (clockwise), Step 1 on figure .




6. Take the twisted Strand A and bring it toward your body, *over and then under* Strand B, Step 2 on figure.

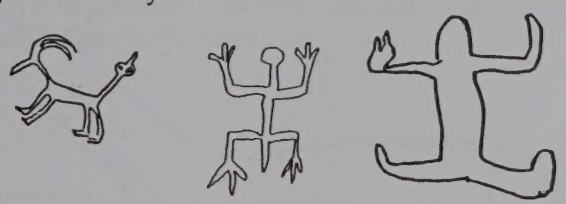
7. Hold strands A and B between your left forefinger and thumb about where you crossed A over B. Repeat the twirling and crossing sequence: pick up Strand B, twirl it away from your body, and cross it over and under Strand A.

8. Continue these steps. The twirling in one direction and crossing in another direction forms an interlocking pattern like that of machine-made rope. If the cordage looks all twisted in the same direction, then the locking twist is not taking place, and usually the strands are being twirled in the wrong direction.

9. Left-handed people will reverse the directions of twirling and crossing. They twirl the strands *toward* their bodies, and cross the strands *under then over*.

10. The process of making cordage is difficult to describe, and it sounds more complicated than it really is. Try it; it's surprisingly easy.

11. Distribute copies of the "Experimental Archaeology" activity sheet to each student or team. Project the "Experimental Archaeology" activity sheet. As a class, work through the first problem. Students complete the remaining problems working individually or in teams.



## Closure:

1. Based on their experience with making cordage and the information in the reading, have the students share their impressions of what daily life of prehistoric people might have been like. In what ways might it have been similar to their own daily lives? In what ways was it different?

2. Tell the students that archaeologists have excavated an archaeological site and more than 100 pieces of cordage were found in it. The cordage artifacts were classified and described as follows (write the information on the board):

Category 1
- Material type: milkweed (or dogbane)
- Average thickness: 3 millimeters in diameter
- Average length: 105 centimeters
- Number of pieces: 68

Category 2
- Material type: sagebrush bark (or juniper bark)
- Average thickness: 6 millimeters
- Average length: 32 centimeters
- Number of pieces: 35

Use scientific inquiry to study the two types of cordage.

a. Ask the question: Why is the sagebrush bark cordage thicker than the milkweed cordage? Brainstorm reasons such as: sagebrush is harder to work with, the sagebrush fibers are thicker.

b. Select one **hypothesis**. For example: Milkweed fiber is stronger than sagebrush bark fiber, so it doesn't need to be as thick as sagebrush bark cordage to be as strong.

c. **Test** this hypothesis by setting up an experiment to determine the relative strengths of cordage made from the two fibers. If you did not use the natural fibers to make cordage in the classroom, you can use different types of commercial string or yarn to design an experiment. For example, test the difference between cotton string and jute string.

d. Unless the milkweed cordage is poorly made it should be stronger than the sagebrush cordage. If the experiment determines that milkweed is stronger than sagebrush bark, ask the following question: Why is there more milkweed cordage than sagebrush cordage in the archaeological site? (Milkweed may have been chosen because of its strength. Availability of the two fibers and the purpose of the artifacts may also have been determining factors.)

## Evaluations:

1. Evaluate students' efforts to make cordage.

2. Have students write a creative story or a report, make a chart, or construct a diorama about living in the Great Basin without modern technology. They need to include five things they would have to know how to do in order to live.

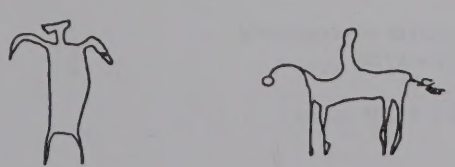
3. Evaluate the students' "Experimental Archaeology" activity sheets.

## Extensions:

Extension 1. Research how such major technological changes as the acquisition of the horse and the development of farming as a way of life changed prehistoric cultures. Discuss examples from modern life such as automobiles and computers.

Extension 2. Demonstrate and/or display cordage in an Archaeology or Culture Fair.

Extension 3. Invent a modern use for cordage made from native plant fibers.



## Links:

Section One, Lesson 6: "Classification and Attributes"

Section One, Lesson 7: "Scientific Inquiry"

## References:

Aikens, C. Melvin, 1970, *Hogup Cave.* Universtiy of Utah Anthropological Papers No. 93. University of Utah Press, Salt Lake City, UT.

Wheat, Margaret M., 1967, *Survival Arts of the Primitive Paiute.* University of Nevada Press, Reno, NV.

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**Experimental Archaeology Activity Sheet Answers**

1. To answer the questions follow this general process for 10 meters of cordage
   a. Convert to centimeters
      100cm x 10m = 1,000 cm
   b. Set up the ratio
      10/25 = X/1,000
   c. Solve for X
      25X = 10,000
      10,000 ÷ 25 = 400 minutes
   d. Convert to hours and minutes
      400 ÷ 60 = 6.6 hours or 6 hours 40 minutes

1. for 100 meters of cordage
   100cm x 100m = 10,000cm
   10/25 = X/10,000
   25X = 100,000
   100,000 ÷ 25 = 4,000 minutes
   4,000 ÷ 60 = 66.6 hours or 66 hours 40 minutes

2. for 10 meters of cordage
   100cm x 10m = 1,000cm
   7/25 = x/1,000
   25X = 7,000
   7,000 ÷ 25 = 280 mins.
   280 ÷ 60 = 4.6 hours or 4 hours 40 minutes

2. for 100 meters of cordage
   100cm x 100m = 10,000cm
   7/25 = x/10,000
   25X = 70,000
   70,000 ÷ 25 = 2,800 minutes
   2,800 ÷ 60 = 46.6 hours or 46 hours 40 minutes

3. conversion is not necessary
   1/2 = x/50
   2x = 50
   50 ÷ 2 = 25 stalks

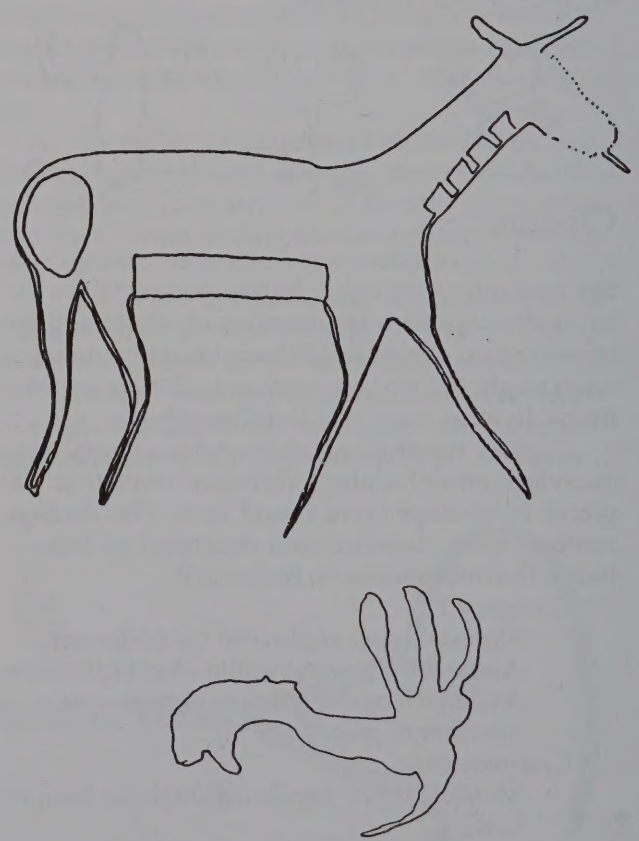
4. 100cm x 2m = 200cm
   10/25 = x/200
   25x = 2,000
   2,000 ÷ 25 = 80 minutes
   80 ÷ 60 = 1.3 hours or 1 hour 20 minutes

5. First compute the number of square meters in the net.
   100cm x 42m = 4,200cm
   4200 x 120 = 504,000 sq. cm.
   504,000 ÷ 10,000 = 50.4 sq. m.

   Measure the approximate length of cordage in each square meter of the net. Multiply that amount by 50.4 the number of square meters in the net. If there are 3 meters of cordage in each square meter then there are 3x 50.4 = 151.2 meters of cordage in the entire net. Figuring 10 minutes per 25 centimeters of cordage, compute the amount of time required.

   100 cm x 151.2m = 15,120cm
   10/25 = X/15,120
   25X = 151,200
   151,200 ÷ 25 = 6048 minutes
   6048 ÷ 60 = 100.8 hours

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## Experimental Archaeology Name: _____

1. If it takes 10 minutes to make 25 centimeters of cordage, how long would it take to make 10 meters of cordage? 100 meters?

2. If you increased your speed from 10 minutes per 25 centimeters to 7 minutes per 25 centimeters, how long would it take to make 10 meters of cordage? 100 meters?

3. If it takes one milkweed stalk to make 2 meters of cordage, how many stalks would it take to make 50 meters?

4. It takes approximately 2 meters of cordage to make a snare to catch a small animal. How long would it take to make the cordage for the snare if you can make 25 centimeters in 10 minutes?

5. A cordage net measuring 42 meters by 120 centimeters was found at an archaeological site. How long do you think it took to make the net? How would you find out? (Outline the process).

# THE PAIUTES TIE THEIR WORLD TOGETHER

Modern-day Paiutes are the descendants of people who lived in the Great Basin of the western U.S. for the past one thousand years. The Paiutes were very skilled and well-adapted to living in this region. They used tools made only from natural materials: bone, antler, sinew and hide from animals, plant fibers, clay, and stone. They were a hunting and gathering people who knew a lot about the Great Basin's varied environments, seasons, and resources. In the fall, Paiute people gathered pine nuts in the pinyon forests of the Basin's many mountain ranges. Springs and marshes provided fish, waterfowl, game, plant food, and building materials.

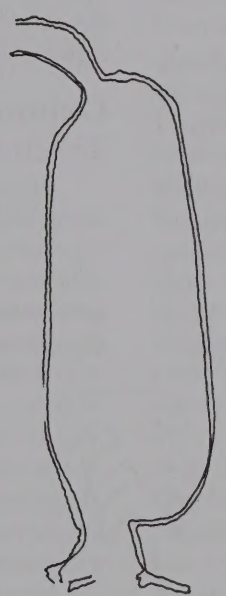
The Paiutes and their ancestors had to know where to find the things that they needed and at what time of year they were available. Stone that can be made into tools is found only in certain places. Large flocks of geese and ducks may live in the marshes for only a few weeks in the spring and fall. Many native plants that have tap roots (like carrots) are tasty and nutritious, but some are poisonous and it is difficult to tell the difference if one is not familiar with the plants. Specific knowledge of the environment was often a matter of life and death.

The Paiutes needed many tools to live in the Great Basin, but cordage was an especially important part of their lives. "Lacking nails, bolts, and screws the Paiutes tied their world together. They tied their wood and willows in bundles to carry them into camp; they tied small game onto their waist bands; they tied tules to make boats, and cattails to make houses; they tied babies in baskets, and arrowheads to shafts. They used cords in place of buttons and safety pins, to make traps, to catch fish and hang them to dry. In addition to the tough rope of cattails and sagebrush bark, they made strong string of sinew and human hair. They also used supple young willow withes for tying. But, the finest cordage of all was made of Indian hemp, or dogbane" (Wheat, 1967, p. 55). The Paiutes used many different kinds of fibers and each was suited to a specific purpose because of its special properties. They needed to know where and when to find each type of fiber, how to prepare the fibers, and how to make useful objects from them.

**Reference:** Wheat, Margaret M., 1967, *Survival Arts of the Primitive Paiute.* University of Nevada Press, Reno, NV.

## SECTION THREE

# ISSUES IN ARCHAEOLOGY





# INTRODUCTION

The lessons in this section provide opportunities for students to examine issues concerning archaeological resources and their protection. Although some of the issues are controversial, many teachers have successfully used lessons from Section Three with their students.

## Kathleen Atkinson, Fourth Grade Teacher

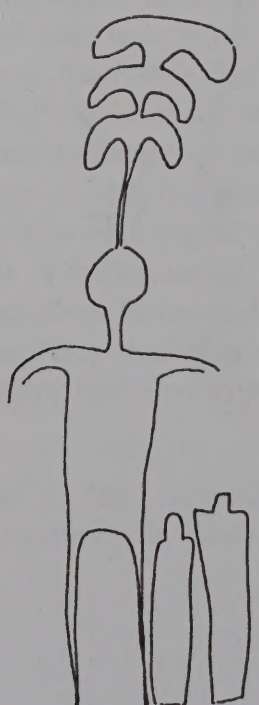
*"I was hesitant to do ethical/values-type lessons with my fourth graders. I thought that these types of activities might be too sophisticated for them, but I decided to try it and see what would happen. We had completed a unit on archaeology, ... I chose to have them do* ***Artifact Ethics*** *from Section Three. I was amazed and pleased with their enthusiasm for the activity, and with the insights and conclusions they reached. They enjoyed the lesson and I think they appreciated being asked their opinions about a real issue they care about."*

## Laura R. Copeland, Junior High School Teacher

*About* ***Artifact Ethics****, Section Three . . . "I love activities where there are no right or wrong answers . . . where every answer is just about as good as the other. In that way, students think more deeply about why they chose the answer that they did--not just because it was right or wrong. Everyone becomes a winner. This lesson is adaptable to many subjects where discussion of values is involved."*

## Deborah K. White, Sixth Grade Teacher

*About* ***Rock Art Three,*** *Section Three: "I like doing things that shock them [the students], rather than dancing around the subject. This is a good opportunity. The only reservation I had was that I wanted them to fully understand why we did what we did before they left for the day. Everything worked just fine."*





17

# ARCHAEOLOGY AS A CAREER

| | |
|---|---|
| SUBJECTS: | Science, careers |
| SKILLS: | Knowledge, comprehension, application, evaluation |
| STRATEGIES: | Reading, research, brainstorming, interviewing, writing |
| DURATION: | 45 to 60 minutes |
| CLASS SIZE: | Any |

## Objective:

In their study of archaeology as a career, students will read essays and complete an activity to gain an understanding of and appreciation for the career of a professional archaeologist.

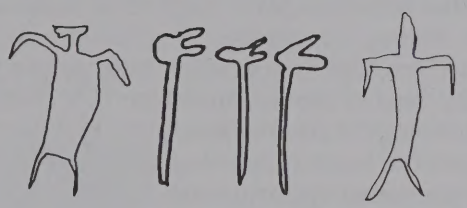
## Materials:

Copies of the two essays for each student.

## Background:

Archaeology is one of four sub-fields of anthropology. Anthropology is the study of humanity, in the broadest sense. **Linguistic** anthropologists study languages—how they change, how they are related to one another, and the relationship between culture and language. **Cultural** anthropologists study living groups of people. **Physical** anthropologists analyze the physical characteristics of human populations, and hominid evolution. **Archaeologists** study human cultures by analyzing material remains—artifacts and sites.

Anthropologists study human cultures and how they change. They seek to make general statements about human behavior. Anthropology addresses questions such as: In what ways does a culture change when people who were nomads become village-dwelling farmers? How does a technological invention, such as the automobile, change society? Is the passage through adolescence to adulthood less traumatic in some cultures than it is in others? Archaeology is the method anthropologists have of studying these kinds of questions through time. Archaeology is the laboratory of time, where human cultures, and how those cultures have changed, can be studied over thousands of years.



Archaeology is related to history in that both attempt to understand the past. The differences between history and archaeology center on the types of evidence used and, to some extent, the kinds of questions asked of that evidence. Historians rely mainly on written documents to study the past. They examine old courthouse records, newspapers, books, diaries, and letters, for example. Archaeologists study artifacts and sites—the things people used and the places where they used them.

Many people think that archaeologists study only ancient cultures, and that historians study only more recent events; yet historians do study the written records of the ancient Egyptians, which are over 5000 years old, and some archaeologists research the behavior of modern people by studying their garbage. In a nutshell, archaeology is a method of studying the past, even the past of 10 minutes ago, by researching material evidence—the *things* people used. History is a method of studying the past by researching written records.

In the United States, archaeologists earn degrees in Anthropology; but in some other countries, archaeology is considered to be its own discipline. A few colleges in the U.S. offer degrees in archaeology. Most practicing archaeologists have a Bachelor of Arts degree and a Master of Arts degree. Many archaeologists also have a Doctor of Philosophy degree, a necessity for becoming a university professor. Considerations for selecting a college or university include the kinds of programs offered there, the opportunities for fieldwork and internships, and the background and research interests of the faculty. At the undergraduate level, a broad anthropological background and an archaeological field school are most important. It is often advisable to seek employment in archaeology after completing

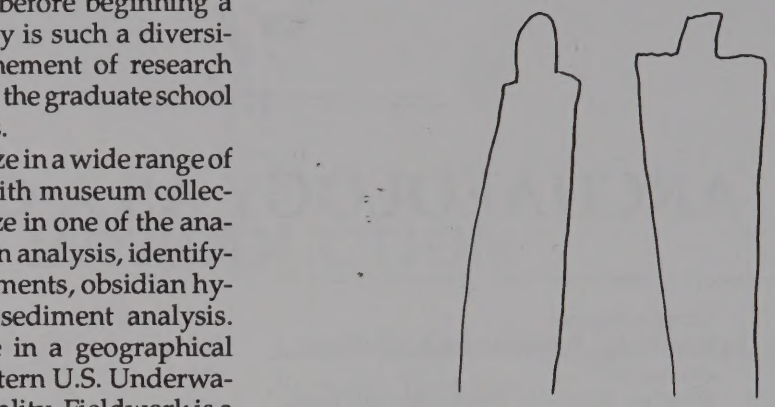
an undergraduate degree and before beginning a graduate program. Archaeology is such a diversified field of study that a refinement of research interests will help a person select the graduate school that best meets his or her needs.

Archaeologists can specialize in a wide range of topics. Some choose to work with museum collections. Others decide to specialize in one of the analytical techniques, such as pollen analysis, identifying animal bone and plant fragments, obsidian hydration dating, or geological sediment analysis. Some archaeologists specialize in a geographical area, like Peru or the Southwestern U.S. Underwater archaeology is another speciality. Fieldwork is a component of most archaeologists' work.

Employment opportunities in archaeology are primarily with colleges and universities, state and federal agencies, and private consultant firms. Cultural resource management is a branch of archaeology that grew out of legislation requiring state and federal agencies to consider the impact that a proposed development project, such as a pipeline or road, could have on prehistoric and historic sites. Governmental agency and consultant firm archaeologists as well as universities with an archaeology contracting division frequently do work on proposed development projects. Archaeologists pursuing research topics often receive funding by writing grant proposals.

Recently, there has been a surge of interest in involving the public in archaeology. Interpretation of sites, publications written for a general audience, tours, curriculum development, and children's activities are all a part of this new specialty, "archaeo-education."

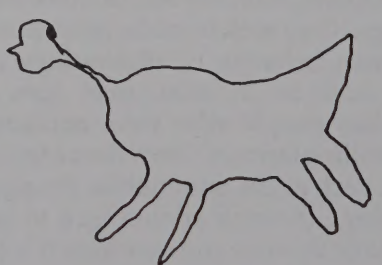
Archaeology is a study that requires a broad understanding of many things--soils, plant and animal life, geology, surveying, chemistry, computers, statistics, and the social sciences, to name a few. People with interests in many fields will find an opportunity to integrate them in archaeology. Sometimes skills learned in archaeology will lead a person to new employment opportunities and career directions in related fields. Fieldwork in remote areas and foreign countries is another aspect of archaeology that many people enjoy. Also, archaeology is a career that is inviting to women. Nationwide, nearly half of all people receiving degrees in Anthropology are women, and many become professional archaeologists.

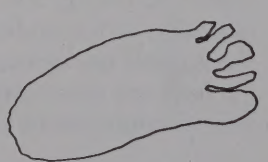


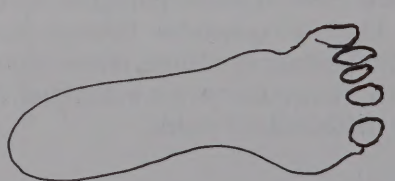
## Procedure:

This lesson can be used in a variety of ways. It can be a part of a careers fair or an element in a unit on archaeology. Some suggestions:

- Students research possible specialties in which an archaeologist might work. Also have them list the skills they think a person should have in order to work in that specialty.
- In small groups, students create a list of questions they would want to ask an archaeologist about his or her profession. They then arrange to interview an archaeologist.
- Students read the profiles of two archaeologists and write a short essay about why they will or will not consider a career in archaeology.
- Invite archaeologists working in a variety of specialities to speak to your class or be panel members discussing questions and issues identified by the students.
- Ask students to think of other fields of study that relate to archaeology. Conversely, ask them how they think being an archaeologist could provide a person with background in other fields.
- Either individually or as a small group project, students interview an archaeologist on the future of archaeology as a career.

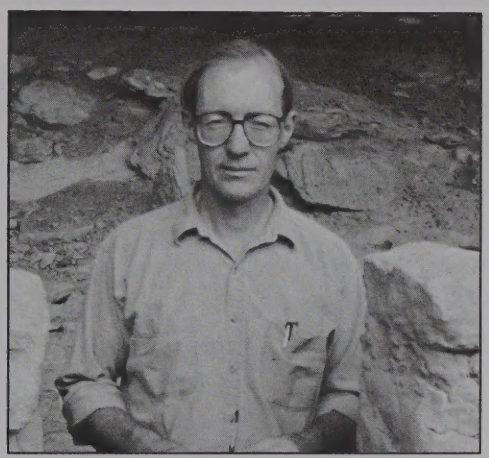






# PROFILE OF AN ARCHAEOLOGIST

## WINSTON HURST



Winston Hurst lives in Blanding, Utah. He does research for various archaeological companies and teaches classes at the San Juan Center of the College of Eastern Utah. He is also a paid instructor on backpacking and horsepacking trips to areas of archaeological interest. Winston was born and raised in Blanding, Utah, and he is a graduate of San Juan High School. He earned his B.A. Degree in Archaeology from Brigham Young University and his M.A. Degree in Anthropology from Eastern New Mexico University.

**How did you become interested in archaeology?**

I was always fascinated with ancient things. By the time I was ten, my brother and I had a lab set up in a storage room and were pretending to be archaeologists. We spent a lot of time hiking around Blanding, exploring Indian ruins.

**When did you decide to be an archaeologist?**

In 1970, while serving in the Army during the Vietnam war, I spent a lot of time bored and reading. Some of the books were about archaeology and archaeologists. I realized then that some people really do archaeology for a living, and if they do, so could I. When I got out of the Army I enrolled in the archaeology program at BYU.

**What kinds of archaeology jobs have you had?**

I have worked on many surveys and excavation projects in Utah and New Mexico. For five years I was the curator at Edge of the Cedars Museum in Blanding.

**What do you enjoy about being an archaeologist?**

I enjoy having a wide range of knowledge about humankind and the natural world, and especially the Anasazi, the Utes, and the Navajos and their ancestors, as well as the history of my own ancestors. In the course of doing archaeological work, I enjoy being at times a photographer, a map maker, a soil scientist, a library researcher, a teacher, an artist and a writer. I like being paid to explore, and to study and read the land—being able to know that I'm standing in the remains of a house that was lived in 1200 years ago, or in a camp used during the late Ice Age, 10,000 years ago. I also like very much the way archaeology combines mental challenge with work in the outdoors, and being a part of the fight to save archaeological remains from being destroyed by selfish and short-sighted people.

**What do you dislike about being an archaeologist?**

I don't like the long hours and low pay, never having quite enough funding to do the job as well as I would like, and putting in long hours for free to make up for it. I dislike conflicts with relatives who want to destroy ruins just to find artifacts, but who don't want to learn why that is wrong.

**Have you made any important discoveries?**

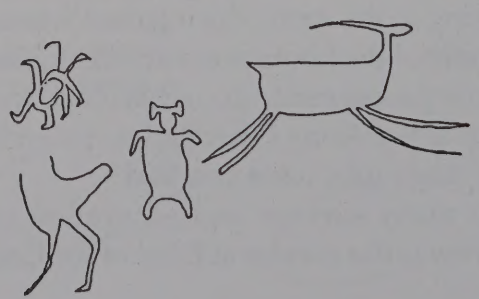
During the 1970s I found and mapped almost 250 old Navajo and Ute sites around Blanding and added a whole new chapter to local written history that never before had been recorded. The most exciting thing for me recently has been the discovery of an ancient Anasazi road system in southeastern Utah.

**What advice would you give a young person considering a career in archaeology?**

Pay attention and learn everything— be like an information sponge. The great thing about archaeology is the way it combines all kinds of skills, from math to biology to art to computers to public speaking. Start early. Read a lot, and arrange to help work on archaeological projects. Do not start collecting artifacts on your own—that will not help you become an archaeologist; it will give you a bad reputation, and it is against the law.

**What else would you like to tell people about archaeology?**

The land is not just a big vacant lot that we can trash out and mess up without hurting anything. The land and the ancient remains on it are like a great book, the greatest of all books about the history of humanity. This book takes great patience and discipline to read, but it's worth it because it contains vast knowledge that cannot be gotten anywhere else. It is also a very fragile book, and a lot of it has already been destroyed without ever being read. More is being destroyed every day. This should give everyone a feeling of sadness and anger and a desire to help stop this destruction.



# PROFILE OF AN ARCHAEOLOGIST

## DIANA CHRISTENSEN



Diana Christensen lives in St. George, Utah, and is the District Archaeologist for the Bureau of Land Management Arizona Strip District. Diana grew up in Bountiful, Utah, and graduated from Viewmont High School. She received an associate's degree from Ricks College, Rexburg, Idaho, and earned her B.A. and M.A. degrees in Archaeology from Brigham Young University.

**How did you become interested in archaeology?**

I read a book on Tutankhamen, Egypt's boy king, when I was in the sixth grade. I immediately wanted to become an Egyptologist. Over the years my interests expanded to include archaeology in general.

**When did you decide to be an archaeologist?**

When I was a junior in college, majoring in geology, I discovered that I loved taking archaeology classes and I really enjoyed fieldwork. I decided to follow what I really enjoyed, and changed my major to archaeology.

**What kinds of archaeology jobs have you had?**

I have worked for private consultant companies, a research firm, and state and federal government agencies. I have worked in Louisiana and Missouri, in Mexico and Guatemala, and all over the western United States, mostly doing survey and excavation work.

**What do you enjoy about being an archaeologist?**

The most enjoyable aspect of archaeology for me is working outside and exploring for unknown sites. Trying to figure out what people were doing at those sites is challenging and interesting, and I like that.

**What do you dislike about being an archaeologist?**

I dislike all of the paperwork you must keep track of and complete, such as site forms, maps, photos, and reports. However, it is necessary to leave good documentation of your work, so that others can make use of it too.

**Have you made any important discoveries?**

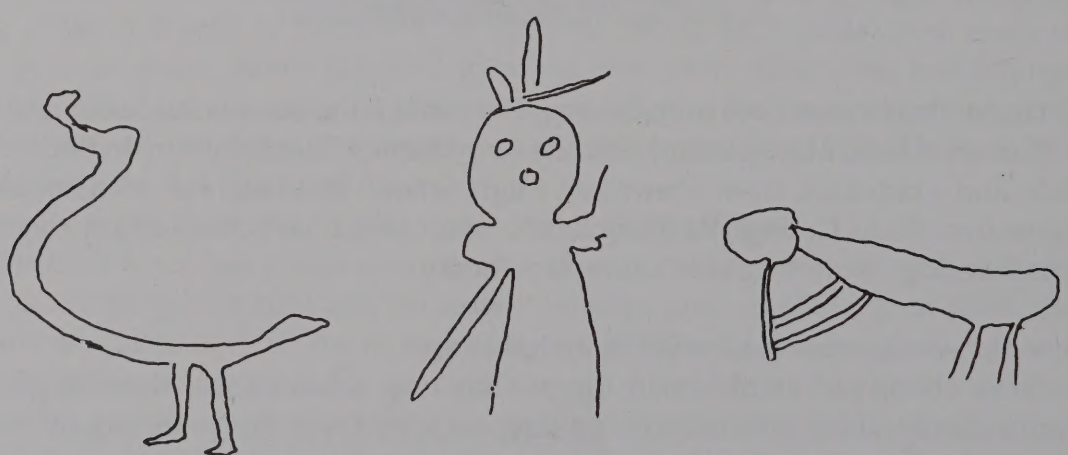
Not in the sense of making the front page of the newspaper; but in reality most of archaeology is not major "finds." It's dedicated slow work, fitting together many small pieces of information to come to an understanding about how past people lived. I feel I have contributed many of these pieces of information to our data base.

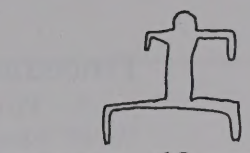
**What advice would you give a young person considering a career in archaeology?**

Take science, math and history courses in school. Apply for programs and opportunities you hear about in archaeology. I have found that many people don't apply for programs because they don't think they will be accepted. Don't be one of these people—go for what you want. You may be surprised when you are accepted.

**What else would you like to tell people about archaeology?**

If you want to be an archaeologist, go for it! When I was studying archaeology at BYU, everyone, even my parents, advised me against it. They thought I would never get a job as an archaeologist. I am very glad that I didn't listen. I love being an archaeologist!





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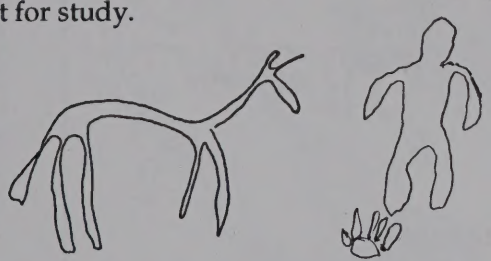
# ROCK ART ONE : AN INTRODUCTION

| | |
|---|---|
| **SUBJECTS:** | Science, social studies, language arts, art |
| **SKILLS:** | Knowledge, comprehension, analysis, evaluation |
| **STRATEGIES:** | Brainstorming, discussion, visualization, drawing, writing, observation |
| **DURATION:** | 45 to 60 minutes |
| **CLASS SIZE:** | Any |

## Objectives:

In their study of rock art students will use art materials, colored photographs, and rock art examples to:

1. Differentiate between symbol, petroglyph, pictograph, and rock art.
2. Interpret rock art to illustrate its importance in the cultural heritage of a people and as a tool for learning about the past.
3. Evaluate the importance of protecting rock art for study.



## Materials:

Transparency or copy for each student of "Clear Creek Canyon Rock Art Panel," and clay or plaster of paris slabs (prepared ahead of time), paper, paint or marker, paper clip. "Interpretation of Clear Creek Canyon Rock Art Panel" masters.

## Vocabulary:

**petroglyph**: a design chiseled or chipped out of a rock surface.

**pictograph**: a design painted on a rock surface.

**rock art**: a general term for the pecking, incising, or painting of designs onto rock surfaces.

**rock art panel**: a group of pictograph and/or petroglyph figures.

**symbol**: a thing which represents something else.

## Background:

Indian people throughout North America created rock art in prehistoric times. Its meaning is mysterious and at times controversial. Some people think that rock art is a type of storytelling. Others believe it depicts religious or spiritual beliefs, while still others regard it as solely an artistic expression.

North American rock art is not a true writing system which can be "read" like Egyptian hieroglyphics or a phonetic alphabet, although some rock art specialists attempt to decode rock art symbols. Archaeologists analyze rock art figures and patterns, and frequently find that different cultural groups made different styles of rock art. Other rock art researchers analyze stories and information from Indian people to draw conclusions about rock art.

Some Indian tribes have oral traditions about rock art and its meaning. Many Indian people believe that the spirit of the makers resides in what they have created; therefore, rock art is living, and it has a spirit. Whatever our responses to, or interpretations of rock art may be, it stimulates our thoughts and imaginations and expands our awareness of cultural expressions. Rock art can mean something different to each person who ponders it.





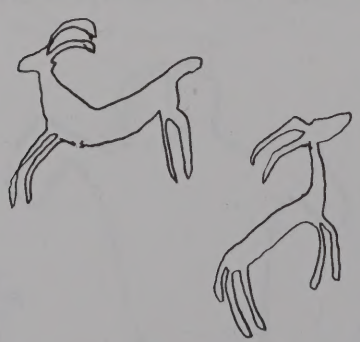
## Setting the Stage:

1. Brainstorm examples of symbols meaningful to us today.

2. Give each student a piece of paper, a marker or paint, clay or plaster of paris slab and a paper clip. Ask them to flatten the clay into a slab and imagine that it or the plaster of paris slab and the paper are rock walls. Ask them to imagine they are living 1,000 years ago. Have them carve a symbol of their culture into the clay or plaster of paris (rock) with the paper clip. Have them paint or draw this same symbol on the paper.

3. Show the students the words "pictograph" and "petroglyph." Ask them to determine which word fits which method of rock design and give reasons for their answers. Verify the correct answer and explain that both design methods are classified as rock art. Or, give them the definitions of the root words prior to determining the correct definitions:

picto = to paint (Latin)
graph = to write (Greek)
petro = rock (Latin)
glyph = carved work (Greek)



## Procedure:

1. Project the "Clear Creek Canyon Rock Art Panel" transparency. Explain that this rock art panel was created by the prehistoric people of Utah.

2. Use the following questions to analyze the rock art panel:

a. What words might you use to describe the symbols on this page?

b. Why do you think people created these designs?

c. If there is a message in these designs, what do you think it is?

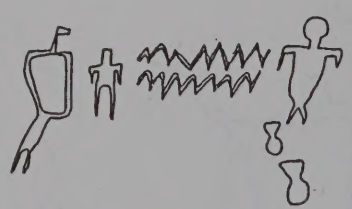
d. Specifically, what might the message be in the symbol labeled with a, b, c? Using the "Interpretation" activity sheet share the four American Indian interpretations of this symbol. (Note: The letters are not part of the original art work.)

3. In what ways might rock art be important to archaeologists' study of ancient people?

4. How might vandalism to rock art create problems for the archaeologist? for the descendents of the prehistoric rock artists? for all of us?

## Closure:

In summary, why is the preservation of rock art important?



## Evaluation:

Instead of answering the last question as a group, require students to answer it individually in a story, poem, essay, advertisement or song.

Clear Creek Canyon Rock Art Panel



## Interpretation of Figure in Clear Creek Canyon Rock Art Panel, Central Utah

**Levan Martineau,** hired by the Paiute tribe of Utah to interpret Clear Creek Canyon rock art.

Martineau thinks this is part of a larger story of the emergence from the underworld.

a. The clan sign of the Badger clan. Badger was involved in and recorded the emergence story.

b. The river reed which the people of the underworld crawled through to get to this world.

c. A god-like figure who is part of the emergence story.

**Indian Joe (Joseph J. Pickyavit),** Ute Indian.

Pickyavit thinks that this figure was left by the "Pueblo Indians" whom he said once lived in Clear Creek Canyon. He feels this figure deals with making rain.

a. Rain cloud making rain.

b. Lightning bolt making lightning with the rain storm.

c. Medicine man with good powers in a rain sing (ceremony to bring rain).

**Wil Numkena,** Hopi Indian and Director, Utah Division of Indian Affairs.

Numkena thinks this figure deals with the emergence into the fourth world.

a. Seed sack that contains the seeds used by the chipmunk to grow a plant for the people, which they used to climb out of the underworld.

b. The spruce or pine tree which they climbed to get out of the third or underworld.

c. A two-horned priest of the higher order of the priesthood and keeper of the oral traditions and the stories of the fourth world.

**Kenneth Smith,** Navajo Indian and early worker at Fremont Indian State Park.

Smith thinks this figure was part of a fertility ceremony.

a. This was the sack of seeds widely planted.

b. This was a stalk of corn; corn was the most important food source for the people.

c. This was some type of god of fertility or germination who helps the crops and plants to germinate and grow.

(Provided through the courtesy of Gordon Topham, Fremont Indian State Park, Clear Creek Canyon, Utah.)

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# ROCK ART TWO: CREATING YOUR OWN

| | |
|---|---|
| **SUBJECTS:** | Science, art |
| **SKILL:** | Synthesis |
| **STRATEGIES:** | Visualization, drawing |
| **DURATION:** | 30 to 45 minutes |
| **CLASS SIZE:** | Any |

## Objectives:

In their study of rock art, the students will use regional rock art symbols or their own symbols to:

1. Create a petroglyph replica.
2. Cooperatively create a "rock art panel."

## Materials:

Brown construction paper, a roll of brown butcher paper, a box of cotton swabs, one cup of chlorine bleach diluted with an equal amount of water, small paper or plastic cups, "Rock Art Symbols" master displayed on the overhead projector or a copy for each student.



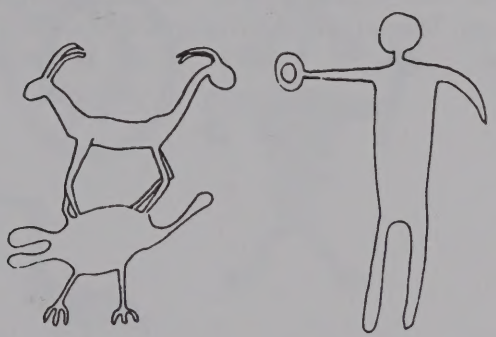


## Background:

Rock art "...occurs in caves, on cliff walls, or on boulders. Rock art occurs all over the world, in virtually every culture, and surviving examples are known to be as old as 30,000 years, from the time of the last Ice Age. In modern America, the most common kind of 'rock' art is that which is painted on the concrete and brick walls of the artificial canyons of our cities and on bridge abutments and rock faces along our highways. In modern American culture, as in all cultures, it expresses the values, attitudes, beliefs, and desires of the society" (Hurst and Pachak, 1989, p. 1).

## Setting the Stage:

Distribute a copy of the "Rock Art Symbols" master or display on the overhead projector. Give students time to observe and talk with each other about the symbols.

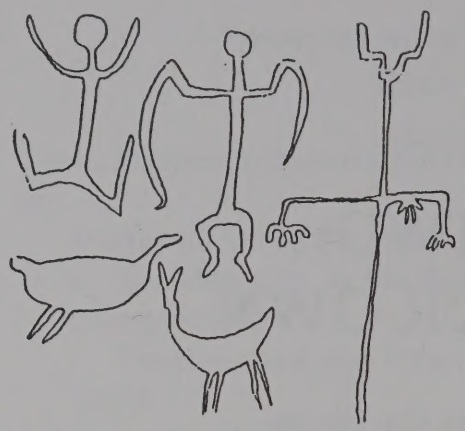


## Procedure:

1. Explain to students that they will be using symbols to make an artwork which resembles petroglyphs. They will also contribute to a "rock art panel." They may use the symbols from the "Rock Art" master for their artwork, or they may create their own.

2. Give each student a piece of brown construction paper and a cotton swab. The art is created by dipping the cotton swab in bleach mixed with an equal amount of water and rubbing the wet cotton swab on the paper to form the desired design. Demonstrate the process, emphasizing to students that they must be very careful not to touch anything but the paper with their cotton swab. Place a jar lid with a small amount of bleach in the center of the work table or carry a small cup of bleach to each student and have them dip their cotton swab. They should only need one or two dips for the activity.

3. Lay the roll of brown butcher paper on a table or floor. Divide the class into groups no larger than 10 students. An adult aide for each group would be helpful. Alternatively, have only one group at a time do the activity.



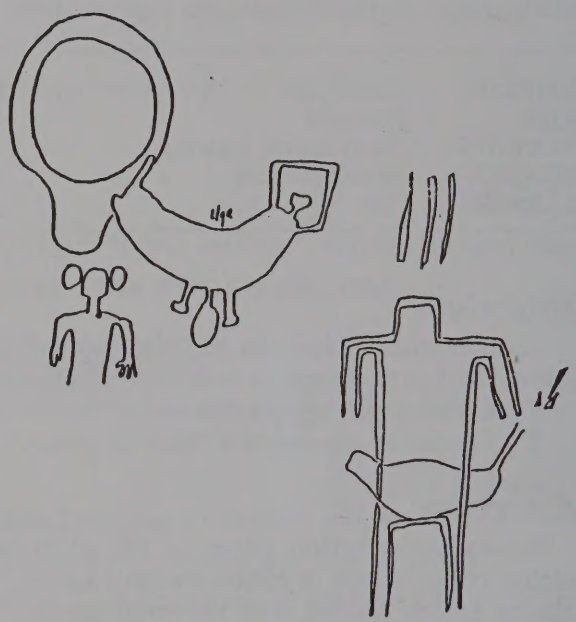
4. After students have completed their own "petroglyph" they take turns making figures on the large piece of butcher paper. Space students a few feet apart, and have small groups work at a time. Exhibit the "rock art panel" in the classroom or hallway. The panel is used for an activity in Rock Art Three.

## Closure:

Have students share the meanings of their rock art.

## References:

Hurst, Winston B., and Joe Pachak, 1989, *Spirit Windows: Native American Rock Art of Southeastern Utah*. Edge of the Cedars Museum. Blanding, UT.



## Rock Art Symbols



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# ROCK ART THREE: PROTECTING OUR PAST

| | |
|---|---|
| SUBJECTS: | Social studies, language arts |
| SKILLS: | Analysis, synthesis, evaluation |
| STRATEGIES: | Observation, discussion, values clarification, brainstorming, decision making, problem solving, writing, drawing, invention, communication |
| DURATION: | One to three 45-minute periods |
| CLASS SIZE: | Any; work groups of 3 to 4 |

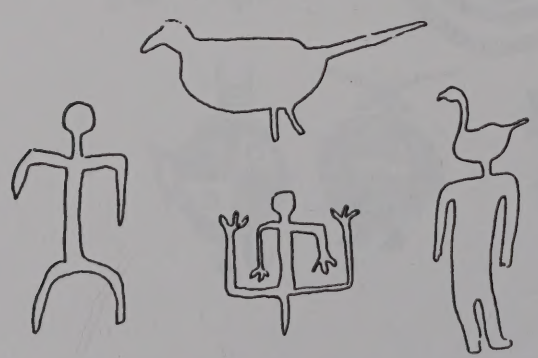
## Objectives:

In their study of rock art, students will use a replica of a vandalized rock art panel to:

1. Examine their feelings about rock art vandalism.
2. Discuss ways to protect rock art and other archaeological sites.
3. Evaluate the Archaeological Resources Protection Act.
4. Develop an educational campaign.

## Materials:

"Rock Art Panel" created in Lesson 19: "Rock Art Two: Creating Your Own"; photograph of vandalized rock art; copies of the "Federal Laws Protecting Archaeological Resources" and "Protecting Rock Art" masters for each student or team. (Optional—copies of your state laws protecting archaeological and historic sites; available from your State Historic Preservation Office.)





## Vocabulary:

**deface:** spoiling or marring the surface or appearance of something.

**vandalism:** willfully or maliciously defacing or destroying public or private property.

## Background:

America is fortunate to have many fine examples of rock art, and a rich archaeological heritage. Our past, however, is threatened by people who collect artifacts and dig sites as well as by those who vandalize rock art panels.

Collecting artifacts, digging sites, and defacing rock art and ruins has several harmful results. First of all, it destroys data, the evidence of people who lived here before us. Sites are very fragile, and one person with a shovel and ten minutes of time can destroy hundreds of years of prehistory. We and the generations of tomorrow are being robbed of the chance to learn about America's past.

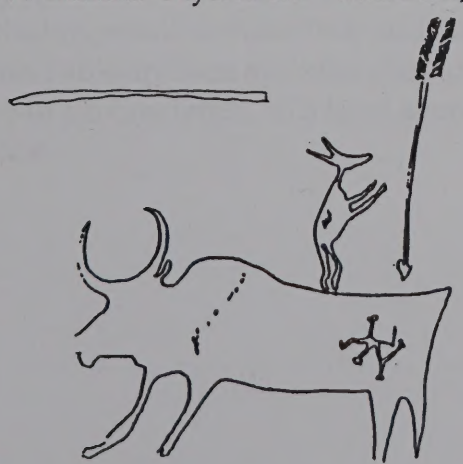
Secondly, disturbing and vandalizing sites attacks the cultural heritage of Native Americans. These sites are the burial grounds, homes and sacred places of their ancestors. Archaeological sites can represent part of their spiritual and cultural legacy. To destroy or deface these places can be the equivalent to someone vandalizing your home, church, or cemetery.

Finally, people who vandalize and destroy sites steal from all of us the opportunity to appreciate and understand other cultures. It is a personally enriching experience to gain a perspective on one's life and time by understanding how and where we fit in the human history of this land.

## Setting the Stage:

1. The purpose of the first part of this activity is to cause students to react to their "rock art panel" being defaced or threatened. You need to decide the best approach for your students. If the students are mature and if they will not think that school is an unsafe place, then anonymously deface the "rock art panel" by painting words over it. Say nothing to the students, but when they begin to talk about it, start the activity. Alternatively, bring the rock art panel into the classroom and, holding a can of spray paint or a marker, ask "How would you feel if I were to write my name over the rock art panel you created? Would that harm it?" Connect their feelings about their rock art being damaged to how Native Americans, archaeologists, and the public might feel when they see vandalized sites.

2. Show students a picture of defaced rock art, preferably one from your own state. Alternatively, show them the photo of vandalized rock art in Buckhorn Wash, Central Utah (next page). Ask them how they feel about the vandalism of these ancient and irreplaceable rock art panels, and what they think should be done about it. It is important to move students beyond the "witchhunt," that is, trying to discover and punish the person who did the damage. Ask students to think of solutions for repairing the damage and preventing vandalism from happening in the future.



3. Distribute "Protecting the Past." Have the students read this page in preparation for creating an educational campaign.



## Procedure:

1. Inform the students about the problem of people vandalizing archaeological sites, including rock art panels, ruins, cave sites, and historic buildings. Explain that vandalism includes a range of behavior, from picking up arrowheads to mining sites with a bulldozer.

2. Ask students to brainstorm: What are the harmful results of vandalism? They can brainstorm in the following categories: destruction of data, destruction of cultural heritage, destruction of historical appreciation; or they can be given the categories after brainstorming. (See "Background" for ideas to add to students' list.)

3. Distribute or project "Federal Laws Protecting Archaeological Resources." Review the ARPA and its penalties, and your state's laws that protect archaeological resources.

4. Assist students in creating a pamphlet, a radio announcement, poster, advertisement, etc. that will communicate to others the importance of protecting archaeological resources. They should include a description of the ARPA, and might also include some of the ideas from "Protecting Rock Art."

## Closure:

Students' products could be shared at visitor centers, libraries, a PTA meeting, a teacher convention booth or a school archaeology fair.

## Evaluation:

Evaluate the students' products.

## Extension:

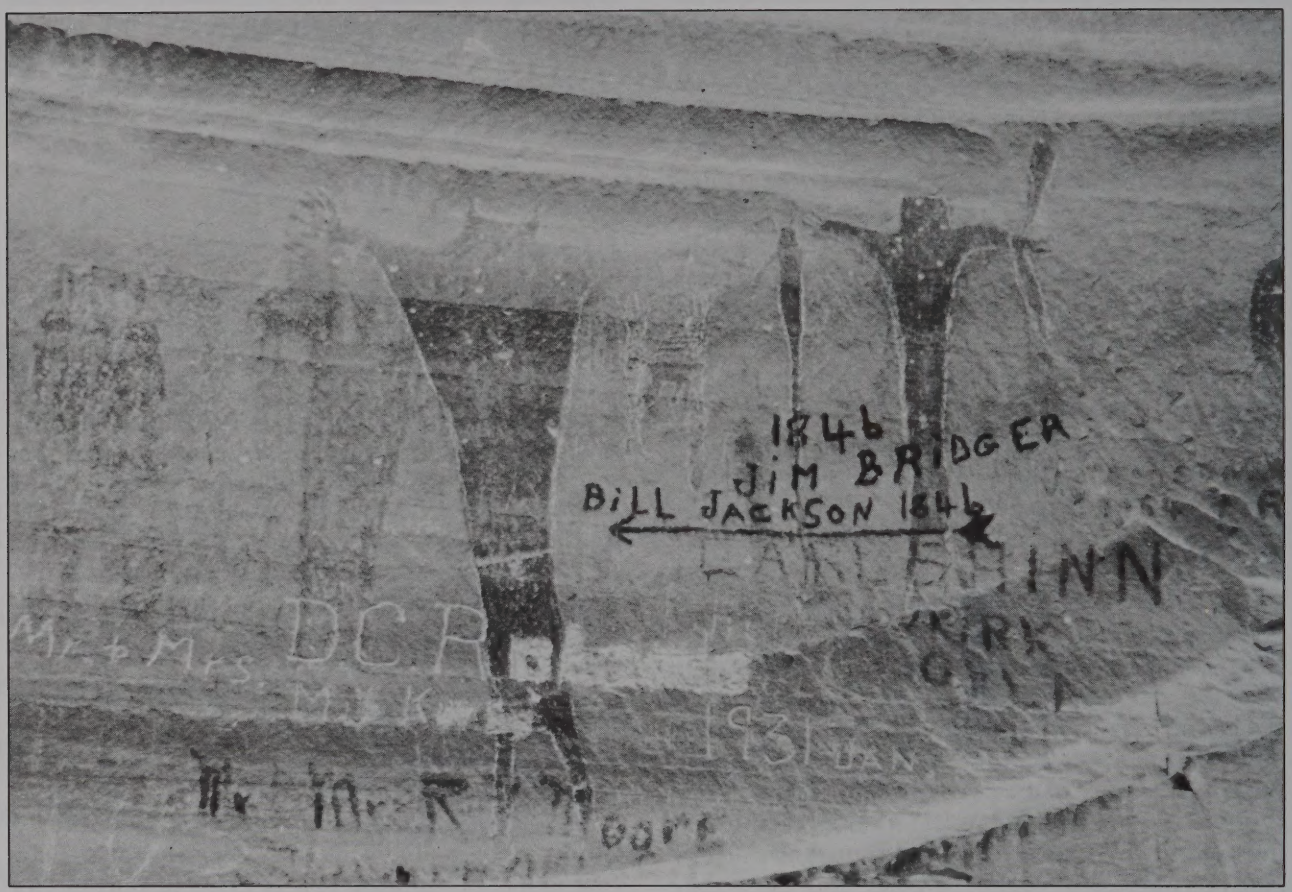
Ask students to propose an improvement to the ARPA. As a class project, have students prepare their ideal law to protect archaeological sites.

## Links:

Section Three, Lesson 22: "Artifact Ethics"

Section Three, Lesson 28: "Take Action—Save the Past"

## Photograph of Vandalized Rock Art Panel




Vandalized rock art, Buckhorn Wash, Emery County, Utah. Photograph by Stephen F. Poreda.

## FEDERAL LAWS PROTECTING ARCHAEOLOGICAL RESOURCES

Federal laws provide for severe penalties to those who disturb and destroy sites more than 100 years old. The Archaeological Resources Protection Act (ARPA) was passed in 1979, and prohibits unauthorized digging and collecting of archaeological resources, including pottery, basketry, bottles, sites with coins or arrowheads, tools, structures, pithouses, rock art, graves and human skeletons. No person may sell or buy any archaeological resource which was illegally acquired. Penalties for those convicted of violating ARPA are:

1. **First Offense**: a person who breaks this law for the first time may be fined $100,000 and spend one year in jail. If the cost of repairing the damage exceeds $500, the offender may receive a fine of $250,000 and spend two years in jail.
2. **Second Offense**: a person who breaks this law for the second time may be fined $250,000 and spend five years in jail.
3. Vehicles and other equipment used in breaking this law may be confiscated.

ARPA provides for REWARDS to people who supply information leading to the arrest and conviction of ARPA violators.

ARPA applies to all public lands, including those administered by the U.S. Forest Service, Bureau of Land Management, the military, Fish and Wildlife Service, the National Park Service, and the Bureau of Reclamation.

Statutes similar to ARPA have been passed by several states. Contact the State Historic Preservation Office to learn what the laws are in your state.

Some people who dig in sites are engaged in an illegal market activity, are armed with weapons, and should be considered dangerous. Never approach someone you see digging in sites or collecting artifacts. Instead, record information about them—their physical description, what they were seen doing, the license number of their vehicle—and immediately report them to a local law enforcement agency.

People enjoying recreation in the out-of-doors occasionally find archaeological sites, and wonder what they should do. Always leave artifacts where they are found, including small surface finds such as potsherds and stone flakes. Discoveries of rare or remarkable artifacts and sites should be reported to the land managing agency, or, in the case of private lands, to a local agency archaeologist or the State Historic Preservation Office.



## Protecting The Past: Things *Not* To Do

1. **Touching** rock art with your hand can harm it.

2. **Making paper rubbings or tracings** may crumble the rock art.

3. **Making latex molds** of rock art should only be done by professionals if the rock art is going to be destroyed by construction or development.

4. **Building fires nearby** can cause serious damage from smoke and high temperature.

5. **Taking it home**. Some selfish people steal rock art by using rock saws and chisels.

6. **Chalking** is harmful to the rock art, and makes it impossible to use new methods of dating the figures.

7. **Re-pecking or re-painting** a difficult-to-see image doesn't restore it, but rather destroys the original.

8. **Defacement**. Insensitive people often paint their names over rock art, or shoot bullets at it. Defacement is a sign of disrespect for other cultures.

9. **Tunnel vision**. People like rock art so much, they often forget to watch where they are walking and may trample or damage important artifacts.

10. **Removal or rearrangement of artifacts** destroys archaeological data. Artifacts should be left where they are found. While it is okay to pick up and look at most artifacts, you should not make piles of artifacts at the site or take them home.

11. **Disturbance of the ground**. Any digging at an archaeological site is not allowed. Even too many visitors walking around may damage an archaeological site. Visitors should tread as lightly as possible, especially on loose slopes and under rock overhangs. Driving off of designated roads may also damage archaeological sites.

(Adapted from Hurst and Pachak, 1989, pp. 25-26).



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# ROCK ART FOUR: CREATIVE EXPRESSION

| | |
|---|---|
| **SUBJECT:** | Art |
| **SKILL:** | Synthesis |
| **STRATEGIES:** | Decision making, sculpting |
| **DURATION:** | Depends on chosen media |
| **CLASS SIZE:** | Any |

## Objective:

In their study of rock art, students will use ancient rock art as inspiration for their own artistic expression.

## Materials:

Rock art reference books, clay, paper maché materials or other three dimensional media.

## Background:

Observing the shapes, designs and textures of rock art transports us back in time. We wonder—who were the creators, what was their world like, why did they create images on rock, what are their meanings?

Joe Pachak, a Utah artist, seeks to come in contact with the creative spirit of the rock art artists through his own art work. He uses original rock art designs as inspiration for three-dimensional sculptures, giving the ancient designs new life through movement and action. As he works with the rock art figures he feels that he makes a connection with the creative spirit of a person from the past, getting closer to that person's ideas.

Students can experiment with this same creative technique using clay or paper maché.

## Setting the Stage:

1. Have the students explore a variety of rock art images in reference books and imagine how they might transform these two-dimensional figures into three-dimensional shapes.
2. Share background information.

## Procedure:

1. Have the students choose a rock art figure to create in three-dimensions.
2. Working with media such as clay or paper maché, the students will transform their rock art figure into a sculpture. Encourage them to add movement and action to their figure.

## Closure:

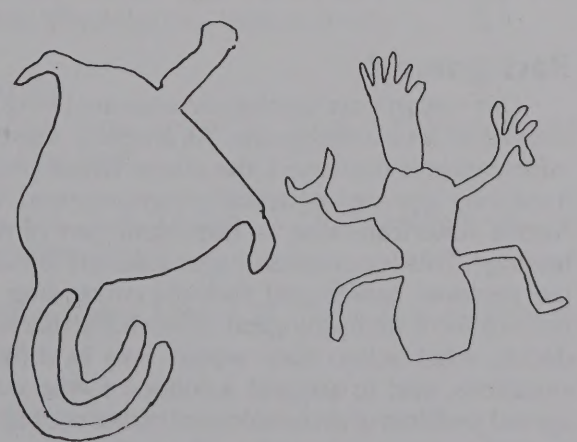
Provide an opportunity for students to share their work, such as at an archaeology or culture fair, or in a display at a mall, in a city library, or at their school.

## Evaluation:

1. Students brainstorm other ideas for transforming rock art symbols into art work.
2. Experiment with one or more of these ideas.

## Extension:

Invite an artist who uses motifs from prehistoric art to talk to the class about the inspiration he or she finds in the ancient images.



22

# ARTIFACT ETHICS

Adapted from "Ethi-reasoning," *Project WILD Elementary Activity Guide*, Western Regional Environmental Education Council, 1983.

| | |
|---|---|
| **SUBJECTS:** | Social studies, language arts |
| **SKILLS:** | Application, analysis, synthesis, evaluation |
| **STRATEGIES:** | Discussion, values clarification, decision making, problem solving, communication, debate, drawing, composing, writing |
| **DURATION:** | One to three 45-minute periods |
| **CLASS SIZE:** | Any; work groups of 3 to 4 |

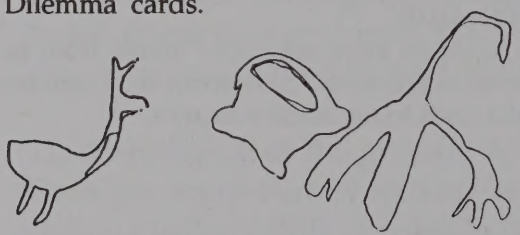
## Objectives:

In their study of archaeological issues students will use ethical dilemmas to:

1. Examine their own values and beliefs about archaeological site protection.
2. Evaluate possible actions they might take regarding site and artifact protection.

## Materials:

Dilemma cards.



## Background:

Our nation's archaeological sites are being destroyed at an alarming rate. As a result, scientific information is destroyed, the places where people lived long ago are aesthetically compromised, and Native Americans lose an important part of their heritage. This lesson encourages students to examine personal beliefs and feelings concerning the protection of archaeological sites and artifacts, to decide what action they would take in difficult situations, and to suggest solutions to the widespread problem of archaeological resource destruction. There are no "right" or "wrong" answers except where laws apply. The lesson should be taught after the students have established a foundation in archaeological concepts and methods.

Federal and state antiquities preservation laws state that it is illegal to collect, deface, injure, or excavate sites and artifacts older than 100 years on public land (see the ARPA law, Lesson 20: "Rock Art Three: Protecting Our Past"). Public land includes lands administered by any state or federal agency, such as the Bureau of Land Management, National Park Service, Forest Service, Bureau of Reclamation, and the Fish and Wildlife Service. States may have additional laws to protect antiquities. Archaeologists conducting approved field work are granted permits by federal and state agencies.

People enjoying recreation out-of-doors frequently discover an archaeological site or artifact. By law, the artifact is to be left in place, and the site left undisturbed. Discoveries of rare or remarkable artifacts and sites should be reported to the land managing agency, or, in the case of private lands, to a local agency archaeologist or the State Historic Preservation Office.

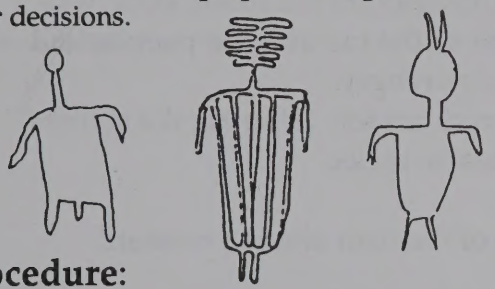
Some people collecting artifacts and excavating sites are engaged in an illegal market, are armed with weapons, and are to be considered dangerous. Students should never approach someone they see collecting artifacts or excavating sites. The best thing to do is to record information about the people—their physical description, what they were seen doing, the license number of their vehicle—and immediately report them to law enforcement authorities. The Archaeological Resources Protection Act allows for rewards for those providing information that leads to the arrest and conviction of people disturbing sites.



## Setting the Stage:

1. Ask the students: Have you ever been in a situation when you were not sure of the right way to behave or respond? For example, your best friend has his hair cut in a style you think is very unattractive. What do you tell your friend when he asks if you like the way it looks? Or, your best friend shows you a video game she has stolen from another friend's house. What do you say to your friend? Do you report the incident to someone? If so, whom?

2. Explain that the following activity will require decision making about difficult situations. As they share solutions to the following dilemmas, students should be prepared to give reasons for their decisions.

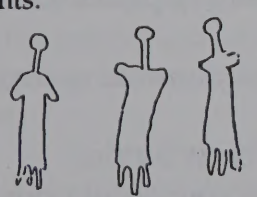


## Procedure:

1. Copy the dilemma pages and glue each dilemma on an index card. Other dilemmas could be written that are more specific to problems in your area. (Students could also create Dilemma Cards, with each student responsible for one dilemma.) You may want to laminate your cards.

2. Take one of the Dilemma Cards and read it aloud to the entire class. Without group discussion, ask the class to write a paragraph or two about how they feel about the dilemma, and what they would do about it. Have them keep their papers for their own values clarification (often values change once there is group discussion and others' perspectives are introduced).

Another approach to this activity is to have the students turn in their papers (without names) and write several of their dilemma solutions on the blackboard until you have listed many strategies and viewpoints.



3. Have the students discuss the pros and cons of each solution and perhaps come to a class consensus. This activity can help students clarify their values, while demonstrating that there are many perspectives on any issue. Ask the students to reconsider what they had originally written. Have their values changed after listening to other viewpoints?

4. Divide the class into groups of 4 to 5 students and give each group one of the Dilemma Cards. Have the students discuss the dilemma as a group and decide how they would solve the problem. If students create a solution they think is better than the ones listed, allow them to share this solution. Allow about 15 minutes for their discussion. Choose a spokesperson for each group to report to the class the group's decision and their reasons for taking the actions or positions they did. Were they able to all agree on what they would do?

5. Ask the students if they had enough information upon which to base their decisions. Ask them if their opinion changed once they heard different points of view.

## Closure:

Ask the students to share their overall position concerning the protection of archaeological resources. Or, ask them to create a symbol, story, poem, drawing or song that summarizes their opinion.

## Evaluation:

Evaluate student participation in the dilemma discussions and the closure activities.

## Extensions:

Extension 1. Divide the students into groups as above, but this time give each group the same dilemma. Discuss the ways the different groups addressed the same issue.

Extension 2. Use the Dilemma Cards for a debate.

Extension 3. Have students develop a dilemma solution into a plan that addresses who, what, where, when, how, and why.

## Links:

Section Three, Lesson 20: "Rock Art Three: Protecting Our Past"

Section Three, Lesson 26: "Archaeology—A Conservation Issue"

Section Three, Lesson 28: "Take Action—Save the Past"

## Reference:

Western Regional Environmental Education Council, 1983, *Project WILD Activity Guide*, Project Wild, Boulder, CO.

## Dilemma 1

You are on a camping trip in a national park with some of your friends and your family. Your parents stop the car in the parking lot to visit a famous rock art site. You and your friends are walking up to the rock art when you pass a man and a woman carrying a bag. As you continue walking, you can see the large rock outcrop covered with rock art. You look closer, and see that there is fresh red spray paint covering several of the rock art figures. The paint is still dripping down the wall as you arrive. What do you do?

- Run back to the man and woman and tell them it is against the law to damage rock art.
- Do nothing, mind your own business.
- Get their license plate number, description of the car and the people, and report them immediately to the national park ranger.
- Use some of the wet paint to write on the rock art too. After all, the settlers and Indians wrote their names and symbols on rocks.
- Call the police back home.
- Have your parents make a citizen's arrest of the man and the woman.
- Other.

## Dilemma 2

You are on a scouting trip to a national forest to visit an old historic ghost town. Your scout leader takes you into an old building where there are a lot of relics laying around including bits and pieces of pottery. Your teacher has informed you that historic places are protected by the law and that you should take nothing but photographs and leave nothing but footprints. As you are leaving, you notice that your scout leader is picking up several pieces of pottery and some of the other artifacts. Several of the scouts are doing the same thing. When you tell the leader what your teacher said about not taking artifacts, the leader answers by saying, "Taking little things like broken pottery doesn't count." What do you do?

- Act as though you saw nothing, let them take the pottery pieces home.
- Pick up just one piece of pottery as a souvenir.
- Do nothing, knowing that you were obeying the law by not taking anything.
- Find another scout troop.
- Ask your parents to report the scout leader to the Forest Service.
- Ask a professional archaeologist to come and talk to your scout troop.
- Other.

## Dilemma 3

You are a judge in a case where a man has been charged with digging up and selling ancient artifacts through an illegal market. He has been unemployed and is using the money to buy food for his family. What do you do?

- Put him in prison for nine months.
- Fine him $5,000.
- Release him with a warning.
- Inform him that there are social services to help him support his family, so that he does not have to destroy the irreplaceable past. Also fine him.
- Sentence him to 100 hours of community service, requiring him to give talks to schools about the importance of protecting archaeological sites.
- Other.

## Dilemma 4

You are an archaeologist excavating sites in an area that is going to be the site of a hazardous waste incinerator. Your excavation team has just started uncovering what appears to be a large American Indian burial site. You know that local Indian tribes would be upset to learn that the graves of their ancestors are being disturbed. They may want to halt or attempt to delay construction of the incinerator. What do you and your team do?

- Decide to break the law and continue to dig the site. Then wait until the site is excavated to tell the Indian tribes about the burials.
- Stop excavating immediately and report the site to the local tribes.
- Continue excavating but ignore the burials and don't record them.
- Stop the excavation and recommend that the site somehow be preserved.
- Resign so you won't have to get involved.
- Other.



## Dilemma 5

You are an amateur archaeologist aware that the reservoir from construction of a large dam will eventually cover an entire canyon containing many ancient Indian sites. One of your friends asks you if you want to go to the canyon and retrieve just a few artifacts because, after all, if you don't, the artifacts will just be buried under water. What do you do?

- Go and get just one or two artifacts in the canyon. Maybe the law does not apply to areas that are going to be destroyed anyway.
- Don't go with your friend, and if your friend goes, anonymously report him/her to the law.
- Refuse to go and tell your friend that it is against the law.
- Let him or her go and get a few things for you.
- Organize a local group of amateur archaeologists to work with professional archaeologists so that more information can be recovered before the reservoir is flooded.
- Other.

## Dilemma 6

You are a county sheriff and live in a small town. You suspect several people are digging sites on Federal land and are illegally selling artifacts. These people claim that they found the artifacts on their own property, and that it is legal to sell them. What do you do ?

- Try to follow these people and catch them in the act.
- Call in federal agents from another town to investigate these people, because many of them are your neighbors.
- Don't do anything unless you catch them in the act because it is your hunch against their word.
- Try and get them involved in amateur archaeology organizations and classes so they will understand the importance of preserving sites on private and public lands.
- Other.

## Dilemma 7

You are hiking in a remote section of a Bureau of Land Management (BLM) wilderness area and discover a large prehistoric pot that is wedged in between two rocks. What do you do?

- Try to remove the pot and take it back to the BLM office.
- Leave the pot where you found it, photograph it, carefully record on a map where you found it and report your information to the BLM.
- Leave the pot there and don't tell anyone about it or its location.
- Remove the pot, hide it in your car and take it home.
- Other.

## Dilemma 8

You are visiting a state park which is a historic site with several rock buildings partially intact. There is a large sign by the ruins saying: "These walls are very fragile! Do not take anything, and do not walk on, or go into the ruins." You are eating your lunch when a family arrives and ignores the sign. Kids are walking on top of the ruins and are picking up glass fragments and old nails and putting them in their pockets. What do you do?

- Ask the family politely if they have read the sign.
- Ignore them; it is really none of your business.
- Tell them they are breaking the law.
- Say nothing and try to hike out first, to find a ranger and report them.
- Other.

23

# THE ROAD SHOWDOWN

| | |
|---|---|
| SUBJECTS: | Science, social studies, language arts |
| SKILLS: | Analysis, synthesis, evaluation |
| STRATEGIES: | Debate, role play, values clarification, decision making, writing, visualization, communication, problem solving |
| DURATION: | One to two 45-minute periods |
| CLASS SIZE: | Any; groups of 3 to 4 |

## Objectives:

In their study of archaeological issues students will use a role play to:

1. Debate the viewpoint of four different interest groups regarding an archaeological site and a road construction project.
2. Formulate their own decision about the proper course of action.

## Vocabulary:

**cultural resources:** a definite location of past human activity, occupation, or use identifiable through field inventory (survey), historical documentation, or oral evidence; includes prehistoric and historic sites.

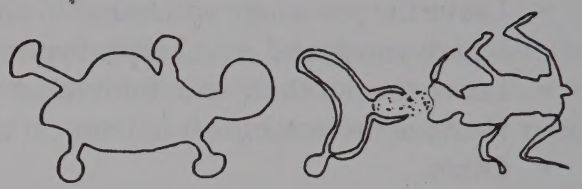
**land manager:** an employee of a federal land managing agency (such as the Bureau of Land Management or U.S. Forest Service) with authority to decide how land under the jurisdiction of the agency and the resources on it will be used. Effects on cultural resources are among the factors weighed in a decision.

## Materials:

Copies of "The Road Showdown" master for each student.

## Background:

Many people care about the past, and for many different reasons. Sites and artifacts can provide meaning on several levels. Using the example of Stonehenge in England, we can list some values people hold toward the past. Archaeologists value Stonehenge for its **scientific** potential. Many people appreciate its **aesthetic** value. Druids, even today,



believe Stonehenge has **spiritual or religious** significance. In recent years, the English punk movement has held a large gathering there every year, to make **social and political** statements. The concessionaires and businesses around Stonehenge also value it for its **commercial and economic** value. To some people, Stonehenge has an **intrinsic** value, and to many Britons, it embodies **heritage** values (Chippindale, 1988; Project WILD, 1983, pp. 257-258).

We can examine these meanings by placing them in one of two categories, consumptive and non-consumptive. Consumptive uses are those that "use up" or deplete the past. Non-consumptive uses are those which do not deplete sites, artifacts, or the knowledge base.

To some people, places and things of the past are tangible reminders of their heritage and history. If a person experiences this by observing and being near certain sites or objects they are acting in a non-consumptive way. The thing or place will be there for them to experience again, and for others to experience. On the other hand, if a person takes an arrowhead, pottery sherd or old bottle, or writes his or her name on the wall of an historic cabin or rock art panel, they are consuming the past, and removing parts of it from others' experience. Other consumptive actions include collecting artifacts to sell or trade, and destruction by development projects, such as plowing and construction of buildings.

In a gray area between non-consumptive and consumptive use is site excavation done by a qualified archaeologist. The use of the site is consumptive, in that physically the site is no longer intact. It is non-consumptive in the sense that information derived from the site is obtained by scientific excavation and becomes public knowledge.

Archaeology is a rapidly changing field. New scientific techniques are developed every year that



allow us to learn more from sites and artifacts. Archaeologists have adopted the ethic of conservation, and laws concerning cultural resources also recognize that we need to conserve—to wisely use—sites. There will not be any more of them, and an archaeologist has to have a good reason to "consume" a site by excavation.

Archaeologists and land managers who make decisions about projects on public lands spend considerable time and energy analyzing how sites and artifacts are to be conserved. The issues surrounding use of the past are complex and often strike at the core of personal values. Responsible citizenship means being knowledgeable about these issues and taking informed and thoughtful actions.

## Setting the Stage:

People often have conflicting ideas about what is the best use of a resource; and some uses preclude others. Brainstorm some examples. Possibilities include wildlife (hunters versus wildlife watchers), rivers (dams and energy versus river running and fish habitat), and fields (farming or housing development). These same kinds of conflicts affect archaeological and historic sites and artifacts as well.

## Procedure:

1. Divide the students into four groups: archaeologists, American Indians, business owners, and recreationists.

2. Distribute "The Road Showdown" master to students. Ask them to read the story through the eyes of their assigned role—to adopt the viewpoint of that interest group. They will be presenting an argument for their viewpoint to a land manager who will make the final decision about the project. The manager can be the teacher, a student, or a panel of students. What should the land manager decide to do about the problem?

3. Give students 10 to 15 minutes to discuss in their groups. Each group appoints a spokesperson to present their arguments. They can propose solutions to the problem which they believe could meet the concerns of all parties, as well as their own.

4. Call the "town meeting" to order and establish two ground rules, (a) no interrupting another person, and (b) be brief and to the point with your arguments. You may also want to impose a time limit on presentations.

5. Each group presents their desired outcome to the manager(s), supporting their goal with solid reasons. General discussion and rebuttal follows.

6. Summarize the discussions by asking each group to choose one or two words which describe the value with which their group is most concerned. Examples may include science, heritage, religion, money, progress, fun.

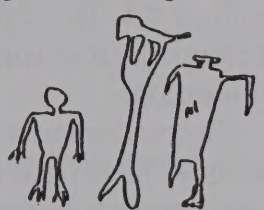
7. Discuss how each of these values and concerns has validity, and that there is no absolute right or wrong answer to the problem. Point out that being a responsible citizen means understanding all of the viewpoints about an issue before making a decision or taking an action. Challenge the students to think of solutions to the problem that could meet everyone's concerns.

## Closure:

Students abandon their assigned role and express in writing what they would personally decide if they were the land manager, and why.

## Evaluation:

Evaluate students' group participation, the clarity and reasoning of their arguments, and their written work.



## Links:

Section Two: "Introduction"

Section Three, Lesson 22: "Artifact Ethics"

Section Three, Lesson 26: "Archaeology—A Conservation Issue"

## Extension:

The scenario and interest groups could be altered to fit a local situation. Students could write about the viewpoint of each of the interest groups.

## References:

Chippindale, Christopher, 1988, "Telling Tales of the Past to the Public: The Stonehenge Experience." Paper presented at the Second Annual Presenting the Past Conference, Minneapolis, MN.

Western Regional Environmental Education Council, 1983, *Project WILD Elementary Activity Guide.* Project WILD, Boulder, CO.



## THE ROAD SHOWDOWN

The state highway department is building a road connecting your town to a new reservoir. In compliance with Federal and State laws, a portion of the project funding has been budgeted for identification and excavation of archaeological sites. Archaeologists are excavating a site that will then be destroyed, because it is directly in the path of the new highway. They have used up all the money that the highway department budgeted for the excavation, but the site is much larger and more complex than they could tell when they first started. They say that the site is of tremendous scientific value and could help answer many questions about the state's past. They need $50,000 to finish the excavations.

Last week, the archaeologists uncovered some human burials. Following the law, they stopped excavating immediately and notified the nearby Indian tribe. Tribal leaders visited the site and told the archaeologists that the site included a cemetery of their ancestors, and that it had significant religious and heritage values to the tribe. Their wishes are that the site be covered up and left in peace... no further excavation, no road over the site.

The local business owners are concerned that the road will be delayed or not built at all. This affects their income significantly. If motorists aren't traveling through the town on their way to the reservoir, they won't be buying gasoline, food, or lodging.

Recreationists are also concerned. Water-skiers and fishing and boating enthusiasts all have been waiting for years for the chance to use the new reservoir. Some have even bought expensive new boats and fishing tackle. They will have to travel 60 extra miles on a dirt road, to get to the reservoir if the new highway isn't built.

24

# GRAVE ROBBERS

| | |
|---|---|
| SUBJECTS: | Science, social studies, language arts |
| SKILLS: | Analysis, synthesis, evaluation |
| STRATEGIES: | Reading, interview, writing, discussion, analogy, values clarification, communication |
| DURATION: | 60 to 90 minutes |
| CLASS SIZE: | Any; groups of 3 to 4 |

## Objectives:

In their study of archaeological resource protection students will use a newspaper article to:

1. Examine an analogy that demonstrates the similarities between robbing of modern graves and of ancient graves.
2. Create a newspaper article that expresses concern about robbing ancient graves.

## Materials:

Copy of newspaper article master for each student.



## Background:

The desire to own and/or sell ancient Indian artifacts has been popular for many years. In search of artifacts, people dig, backhoe and bulldoze their way through sites occupied hundreds of years ago by ancient people. Since ancient people often buried their dead with artifacts, artifact hunters dig their way into grave sites in search of jewlery, pots and other objects. The skeletons are removed haphazardly from their resting place and are often found scattered around the site.

Physical anthropologists study human remains and help archaeologists understand prehistoric nutrition, diseases, and genetic relationships. Irreplaceable scientific information about past human populations is lost forever when ancient grave sites are looted and vandalized. Equally important, vandalism and destruction of human remains offends the living descendants of ancient people.

Grave robbing has never been considered a proper act, yet it happens in both modern cemeteries and ancient sites. Vandalism and theft in modern cemeteries and of ancient grave sites shows a lack of respect for the dead and offends the living relatives of the deceased. All cultures have beliefs about the proper treatment of the dead, and feel very shocked and upset when the graves of their ancestors or loved ones are disturbed.

## Setting the Stage:

1. Discuss the purpose of Memorial Day and the tradition of grave decorating. Explore various reasons for this ritual.
2. Share the Background information with students.

## Procedure:

1. Have the students read the newspaper article.
2. Ask the students to design a verbal, written or visual analogy between grave robbing from modern graves and grave robbing from ancient graves.

## Closure and Evaluation:

1. Ask the students to imagine that they are newspaper reporters interviewing an archaeologist or an American Indian about the robbing of American Indian ancestral graves by people in search of artifacts to collect and sell.
2. The students write an article describing what happened, including thoughts and feelings about the incident expressed by the interviewee.

## Links:

Section Three, Lesson 22: "Artifact Ethics"

SectionThree, Lesson 25: "A Journey Back In Time: A Guided Imagery"

Section Three, Lesson 26: "Archaeology—A Conservation Issue"

# 'Ghoulish' Grave Robbers Hurt Families Of Deceased When Stealing Plot Gifts

by Stephen Hunt, *Salt Lake Tribune* Staff Writer

West Valley City—

For 2 years, flowers, stuffed animals and other decorations have been stolen from the grave of Helga Neathery's daughter. But on Monday Mrs. Neathery and her husband, Allen, caught a grave robber in the act at Valley View Memorial Park, 4400 West 4100 South. It was a woman in her 50s with a plastic garbage sack packed full of stolen booty. Before the woman fled, driving her car over several grave plots to escape, Mrs. Neathery grabbed at the sack and glimpsed items bearing her daughter's name. She also got the car license number. West Valley City police are investigating the theft. "It's a sad thing, a sick situation," Mrs. Neathery said. "We lost our daughter 2 years ago, and {thefts} happened right from the beginning.

"At first it put me in a deep depression. Now I still get upset, but I realize there are people like that," she said. "They're ghouls, they're grave robbers," said Phillip Winder, president of Valley View Memorial Park. "And they have no empathy for the victims."

Mr. Winder said grave robbing is a nationwide problem, but many cemeteries cannot afford security guards to curb it. It can also be grave robbers from legitimate visitors. "We have to tread lightly," he said. "If someone is pulling off their own flowers, we don't want to accuse them of being thieves."

Peter Richards, president of Wastach Lawn Memorial Park, 3401 South Highland Drive, said he has tried everything from 24-hour security guards to hiding alarms in flower arrangements to catch grave robbers.

"We know it's a problem, we're trying to solve it and we want the public to know we're doing our best," Mr. Richards said. He said only three or four thieves have actually ever been apprehended, but all were turned over to police for prosecution. People take home potted plants believing they will die anyway; high school boys grab flower bouquets for girlfriends; and one person was taking flowers to resell, he said.

The thieves apparently believe it is not wrong to steal from the dead," Mr. Richards said. "But they are really hurting the families of the deceased."

Kathryn Young, West Valley City, said flowers have been stolen so many times from her grandmother's grave at Wasatch Lawn Memorial Park that her family has stopped decorating the plot.

Salt Lake Tribune, May 2, 1991

25

# A JOURNEY BACK IN TIME

| | |
|---|---|
| **SUBJECTS:** | Science, social studies, language arts, art, music |
| **SKILLS:** | Synthesis, evaluation |
| **STRATEGIES:** | Discussion, writing, drawing, composing |
| **DURATION:** | 45 to 60 minutes |
| **CLASS SIZE:** | Any |

## Objective:

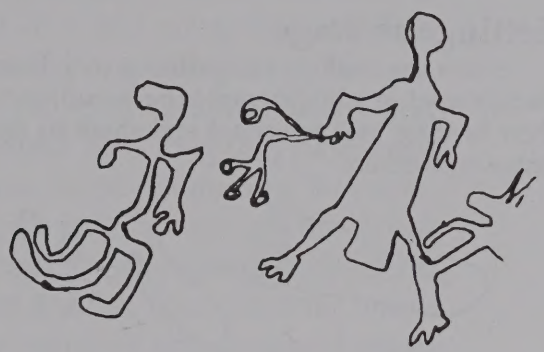
In their study of archaeological resource conservation students will discover and judge an alternative way to enjoy artifacts without removing them from archaeological sites.

## Vocabulary:

**flintknapping**: the technique of making tools from stone.

**pot sherd**: a piece of broken pottery.





## Background:

Byrd Baylor in her book *Everybody Needs A Rock* (1974) expresses the wonder in finding a rock and pondering its source. "Always sniff a rock. Rocks have their own smells. Some kids can tell by sniffing whether a rock came from the middle of the earth or from an ocean or from a mountain where wind and sun touched it every day for a million years." Baylor suggests an atmosphere for this experience. "When you are looking at rocks don't let mothers or fathers or sisters or brothers or even best friends talk to you. Don't let dogs bark at you or bees buzz at you. But if they do, DON'T WORRY." To hold a rock in our hand that may have been created millions of years ago sets our imagination in motion. We can transport ourselves back to the time and surroundings of its creation. We can journey with it through time, imagining what other beings might have touched it or used it. Mystery and intrigue are the forces at work in our mind and many times we want to keep this mysterious object in our possession.

This same mystery is held within the artifacts made by ancient people. Finding an artifact connects us with other humans in a way that books cannot. We can sense the essence of these people and we desire to know them. What made them laugh and cry? How did they spend their day? As our minds travel back in time and connect to the people whose objects (artifacts) we hold in our hand, we desire to keep the object. Or, we recognize the beauty of the object and realize its economic use as a saleable item.

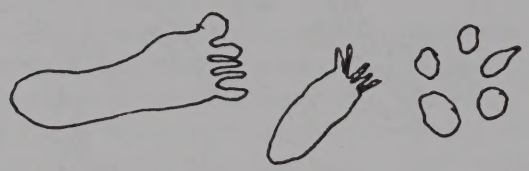
It is a discipline to leave something in its place

when we desire to keep it. This exercise will suggest a way for students to do this.

Be aware that some students may come from homes where religious belief does not allow them to close their eyes during this type of activity. You may suggest that students close their eyes if they wish, but it is not necessary for them to do so.

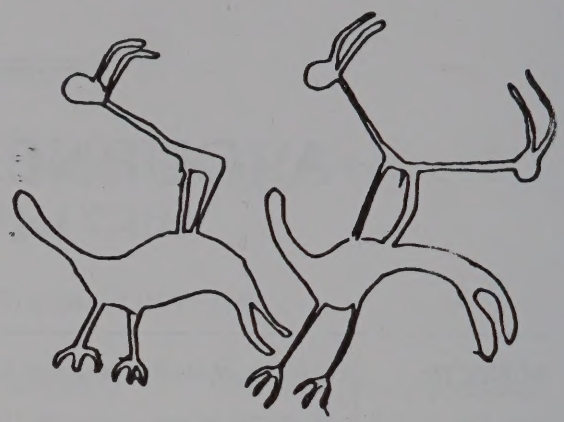
## Setting the Stage:

Share the analogy of finding a rock from the Background. You might want to have students bring their favorite rock to school and share its significance with others.



## Procedure:

1. Explain that the students will be taking an imaginary journey. The purpose of this lesson is to suggest an alternative for appreciating found artifacts without taking them home. Encourage students to relax their bodies, either in their chairs or lying on the floor. They may want to close their eyes. You can help create the mood by turning the lights off and softly playing appropriate music.
2. Read "Your Favorite Place."

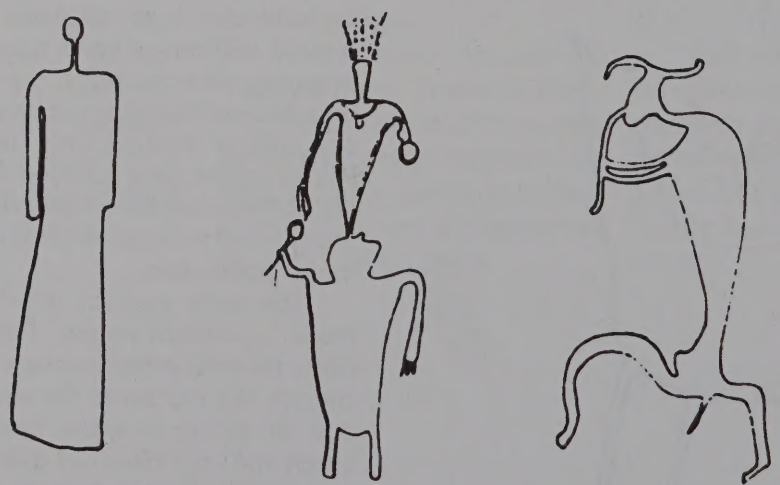


## Closure:

Have students share what they saw, experienced, felt or thought during the reading in a discussion, cooperative team share, drawing, or song. Encourage students to suggest many ways to enjoy an artifact without removing it from a site. Examples: draw a picture of the artifact, write a poem or song, compose a story, take a photograph, bring someone else to the site to see the artifact, describe your find to someone else.

## References:

Baylor, Bird, 1974, *Everybody Needs A Rock.* Atheneum, N.Y.



## Your Favorite Place

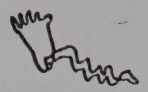
Imagine you are on a camping trip in your favorite outdoor place. Your camp is surrounded by splendid rock formations of all shapes and sizes, their outlines pressing against the deep blue sky. The wind is blowing in gentle gusting breezes, as you hike along. You stoop to pick up rocks of many shapes, sizes, and colors. You wonder about the rocks' names, how they were formed, how long they have been on the earth. One of these rocks you now hold in your hand. Examining it closely, you notice its edges look broken, just like your mom's pottery vase you broke last summer. Its surface feels smooth and cool and is covered with a geometric pattern.

Suddenly, you realize you have found something special. You remember learning about pottery made by prehistoric people and about how archaeologists study these people from their artifacts. You are sure you have found an ancient piece of pottery. You want to keep the pottery sherd so much and you slip it into your pocket. Your heart beats with excitement and you want to run back to camp to share your find. Then you stop yourself. You know artifacts are to be left where they are discovered.

Sitting down, you become very aware of your surroundings. Pot sherds are scattered here and there. The wind blows gentle breezes through the trees. Ravens call to each other. The hot sun warms your back as you gaze out over the landscape. You remove the sherd from your pocket as your mind begins to wander back in time to the village of the ancient people. You are there among the people watching them at their daily activities. In the shade of a tree you see someone flintknapping stone tools. A small child watches intently. The rhythmic sounds of meal being ground on a stone can be heard in the distance. In the shade of a storage room, a potter is skillfully creating a clay pot. Small children run about calling to each other.

(Give the students 2 to 3 minutes to do their own dreaming.)

The sound of a raven's call nearby brings you back to the present. You lay the pot sherd back where you found it, feeling good about your decision. Before you leave you make a sketch of the pot sherd to hang on your bedroom wall.



26

# ARCHAEOLOGY— A CONSERVATION ISSUE

(Adapted from a lesson created by Ray Swapp, Fairview, Utah)

| | |
|---|---|
| **SUBJECTS:** | Science, social studies, citizenship |
| **SKILLS:** | Analysis, synthesis, evaluation |
| **STRATEGIES:** | Analogy, discussion, decisionmaking, problem solving, communication, role play, debate, values clarification |
| **DURATION:** | Two 45-minute class periods |
| **CLASS SIZE:** | Any; groups of 3 to 5 |

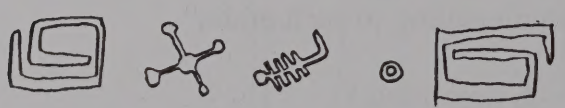
## Objectives:

In their study of archaeological resource conservation, students will work in groups, using analogies and dilemmas to:

1. Infer people's motivations for using resources.
2. Decide and justify the best way to deal with the problems of resource depletion.

## Materials:

Copies of dilemmas for each group.



## Background:

The ethical issues surrounding the protection of archaeological resources are similar to conservation issues in general. People often have different opinions about the value of various resources and whether or not they should be protected. Those who do agree on the value of a specific resource, e.g. African elephants, may disagree on how to protect them. The same is true of archaeological sites and artifacts.

This lesson allows students to explore their values about conservation issues and make comparisons about the value and protection of archaeological sites and artifacts.

## Procedure:

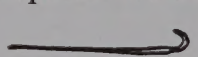
1. Divide the class into three groups. Each group will pick one or two spokespersons and a scribe. Give a copy of NJOMBA to group 1, KERI ANNE to group 2 and MILLIE, JIM AND MCKENZIE to group 3.
2. Each group will read their dilemma, discuss the questions and present their conclusions to the class.
3. At the end of class, give a copy of CHAD AND ALVIN to everyone. Have them take the handouts home and hold a family discussion and/or answer the questions.

## Closure:

1. The next day discuss CHAD AND ALVIN; or, create a panel to include Chad and his father, Alvin and his mother, one or more archaeologists and one or more artifact buyers. Using the questions, each of the panelists must prepare and present a persuasive argument for a solution to the scenario problem. The rest of the class will be the citizens of the small town and will question the panelists about their solutions.
2. As a class, discuss the similarities in each of the scenarios.

## Evaluation:

Evaluate the homework assignment and the students' participation in the dilemmas.



## Links:

Section Three, Lesson 22: "Artifact Ethics"

Section Three, Lesson 23: "The Road Showdown"

Section Three, Lesson 24: "Grave Robbers"

# NJOMBA

Njomba is from Kenya, a country in Africa. He lives with his family in a remote area where the forest is interlaced with areas of open plains. Many elephants live near his home. One day his father came home with many bullets and an AK-47 rifle, a very powerful weapon. His father had found a big bull elephant with huge tusks. It had been shot many times by another hunter, but it still had lived long enough to escape and stagger into the forest before it died near their home. Njomba's father had found the bull and taken the tusks. Later, he had traded them to the ivory trader who comes through the villages every so often. In exchange for the tusks, the ivory trader had given his father the automatic rifle and bullets. He had also made Njomba's father promise that he would only sell the tusks to him when he came through the village. The whole family was excited! Now they would be rich; they would be able to buy anything they wanted! Njomba had heard that the government had made a law against killing the elephants because their population was declining, but Njomba thought there were plenty of elephants. The elephants had been there as long as the people and he believed the elephants belonged to the people, not to the government. Njomba loved the elephants, and liked to watch them; there really were plenty of them. He kept thinking of the things they could buy from the sale of the ivory.

**Questions:**

1. Does Njomba's family really want to kill the elephants? Describe your thoughts or feelings about their reason for killing elephants.

2. To whom do the elephants really belong?

3. What if nobody would buy the ivory? How could this be accomplished?

4. Would it really matter if there were no wild elephants?

5. List your solutions to this problem. Be creative and imaginative.

6. Be prepared to give a two-minute summary and/or solution to the problem.

# KERI ANNE

Keri Anne, age 11, lives in a small logging town in Oregon. Her father is a logger who helps cut the big Douglas fir trees and haul them to the sawmill. Some of the trees are very old and large. Her father said some of them were alive 2000 years ago. When the trees get to the sawmill, they are cut up into lumber which is then sold and shipped all over the country. Her father's company is starting to clear out a large section of old growth forest. The old growth forest has a certain ecology that has existed for thousands of years. After the company clear-cuts the old growth forest, they will plant the area with new seedling trees to make a new forest. When those trees grow up there will be a new forest there, but the ecology will be different than the old growth forest. Environmentalists have legally stopped the cutting of the old growth forest Keri Anne's father is working on because of a bird called the Spotted Owl. The Spotted Owl can only live in old growth forest; it can't live in new growth forest. When all of the old growth forest is cut down the Spotted Owl will die out and become extinct. Now, because there is no work, Keri Anne's father may lose his job. They may lose their house. Keri Anne has listened at her bedroom door while her mother and father talked about it in very serious tones. If they have to move, she will lose her friends and her school, and she loves them both. She is scared and angry at the same time. The trees have been there for thousands of years. How can the government tell people they can't cut them down—because of some rare bird!

**Questions:**

1. Why does the company cut down the old growth forest?

2. What is more important, trees thousands of years old, or jobs for people so they can provide for their families?

3. Does it really matter if the Spotted Owl dies out and becomes extinct? Some birds have already become extinct, and life seems to be going along okay.

4. The lumber is used for construction and to make paper. Are there ways to reduce the demand for lumber? List some.

5. Who really owns the forests? Who should own the forests? Give reasons.

6. Give your solution to the problem. Be creative and imaginative.

7. Be prepared to give a 2-minute summary and/or solution to the problem.

# MILLIE, JIM, MCKENZIE

The year is 2095. The United States has been a province of Canada for about 100 years. It had happened very quickly. It had been hard at first, but things were quite different now. The Canadians are good to the American people; they provide money, food, and even houses on a regular basis. Millie, age 10, and Jim, age 12, live in the United States. They have a Canadian friend named McKenzie who is also 12 years old. One day, McKenzie brought two rings and a necklace to school. The items were very intricate and also quite old. The children were interested in the relics, and asked where he had gotten them. McKenzie said that his father was an engineer and they were digging a big pipeline through the old abandoned graveyard at the edge of town. The trench had gone through several of the graves, and his father had gathered up a few of the old relics. McKenzie's father said that the right kind of relics were worth money to collectors. McKenzie wanted to gather and sell enough to buy a new computer game. He said that there were a lot of other graves out there that could be dug up. He invited Millie and Jim to go with him on Saturday. They could have a picnic. It would be fun! Suddenly Millie and Jim both had a strange feeling. They remembered that both their great-grandparents and their great-great-grandparents were buried in that old cemetery.

**Questions:**

1. Why did Millie and Jim suddenly feel funny?

2. To whom do the relics really belong?

3. Does it really matter if the graves are dug up?

4. Is there a difference between McKenzie digging up a grave, and an archaeologist digging up a grave? Give reasons.

5. What if nobody would buy the relics? How could this be accomplished?

6. Should the government make a law against digging up graves? Give reasons.

7. Give your solution to the problem. Be creative and imaginative.

8. Be prepared to give a two-minute summary and/or solution to the problem.

# CHAD AND ALVIN

Chad lives in a small rural town. His family doesn't have much money. Chad only has an old, rusty second-hand bike. He dreams about having a shiny, new mountain bike. On weekends and holidays in the summer Chad's family digs into the old Indian graves that are near his town. Many of his friends also dig in the graves. If they can find really nice pots, they can sell them to a man who comes through town every so often. His father has told Chad that he has found a grave site that looks really good, and that it has never been dug into. He said that if there were some good pots in the graves, there might be enough money to buy Chad a new mountain bike! Chad was really excited and anxious to dig in the new site. Chad has a good friend named Alvin who is his same age. Alvin is an American Indian. Chad ran to tell Alvin about the possibility of getting a new mountain bike. Chad told him about the new sites his father had found. He told him about the possibility of finding some very nice pots and selling them to the buyer when he came through town. When he told him, however, Alvin acted kind of funny. Chad thought he might be jealous of the new mountain bike. Chad also knew that there was a law against digging in the graves, and that there was a ranger who would arrest you if you got caught. This made Chad mad because the pots had been there when his great-great grandfather had settled the area. The pots didn't belong to anybody then, so how could they belong to the government now? Besides, there were probably dozens of them out there. He knew they would have to be careful, but he kept thinking of the new bike.

**Questions**:

1. Why does Chad's family dig into the graves?
2. Does Chad's family value the past?
3. To whom do the pots really belong?
4. What if nobody would buy the pots? How could this be accomplished?
5. Will it really matter when all of the pots are dug up and sold? Why?
6. Aren't the pots like a vein of gold? You dig them out and sell them for money.
7. Give your solution to the problem. Be creative and imaginative.
8. Be prepared to give a two-minute summary and/or solution to the problem.

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# STATE PLACE NAMES

| | |
|---|---|
| **SUBJECT:** | Social studies |
| **SKILLS:** | Knowledge, analysis, evaluation, compare/contrast |
| **STRATEGIES:** | Mapping, discussion |
| **DURATION:** | 45 to 60 minutes |
| **CLASS SIZE:** | Any; work groups of 4 to 5 |

## Objectives:

In their study of place names, students will use a state map to:

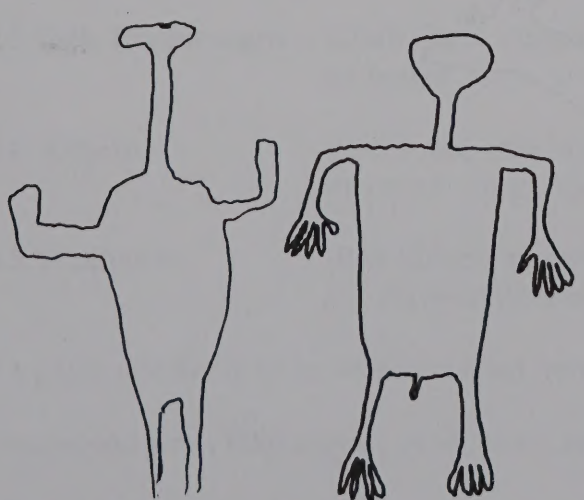
1. Discover the heritage left by Native Americans and settlers in the names of locations.
2. Differentiate the cultural values expressed in names.

## Materials:

One large state map; stars or paper dot markers; and one of the following:

Option 1, your state: one state road map for each work group, laminated if possible; copies of place names in your state (American Indian, and settler or specific immigrant group) masters for each student or group.

Option 2, Utah: one Utah road map for each work group, laminated of possible; copies of "Indian Place Names" and "Settler Place Names" masters for each student or group.

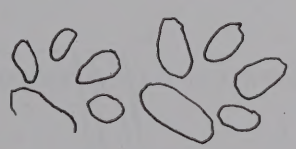




## Background:

This lesson contrasts and compares the names Indian people gave to places with the names later settlers chose. The material given here uses Utah place names as an example. You can prepare a similar set of activity sheets for your state. In addition, you may choose to compare and contrast the names different immigrant groups gave to places in your state.

"Language could not exist, history could not be written, and stories could not be told without names. Names are automatically given to things by human beings. This is our only source of communication, for there is no other way to leave a story for posterity than by and with names" (Van Cott, 1990, p. xiii). The spirit of our states' past people lives on today in the place names of locations. These names are derived from a variety of sources: from Indian words, which usually describe the landscape or qualities of the area, such as "milky water" and "moonlight water"; from commodities settlers produced, such as Coalville, and Carbon County; or from the influence of Spanish, French, and Russian explorers, mountain men, immigrant groups, the military, religious history, and more.



## Setting the Stage:

Show students the names and origins of two towns (in Utah: Parowan—Indian name meaning "marshland"; Magna—derived its name from a

nearby mine). What differences, if any, do they notice about the names?

## Procedure:

1. Give each group of 4 to 5 students a state road map and the lists of state Indian and settler place names. Show students how to find a particular place by looking up the name and coordinates on the map index.
2. Working cooperatively, students are to lightly press a star or dot onto the map next to each listed place name they find. If a listed place name is not on the map index, have students scan for it for bonus points.
3. Display a large state map, and ask each group to share two or three places they have found. As the students call out the names and their meanings, place a star on the map.

## Closure:

As discussion points, or in quiz form, review the following:

Contrast and compare place names derived from the Indian culture and those derived from the settler culture. For what kinds of things were each named ? What can we learn about past cultures from place names?

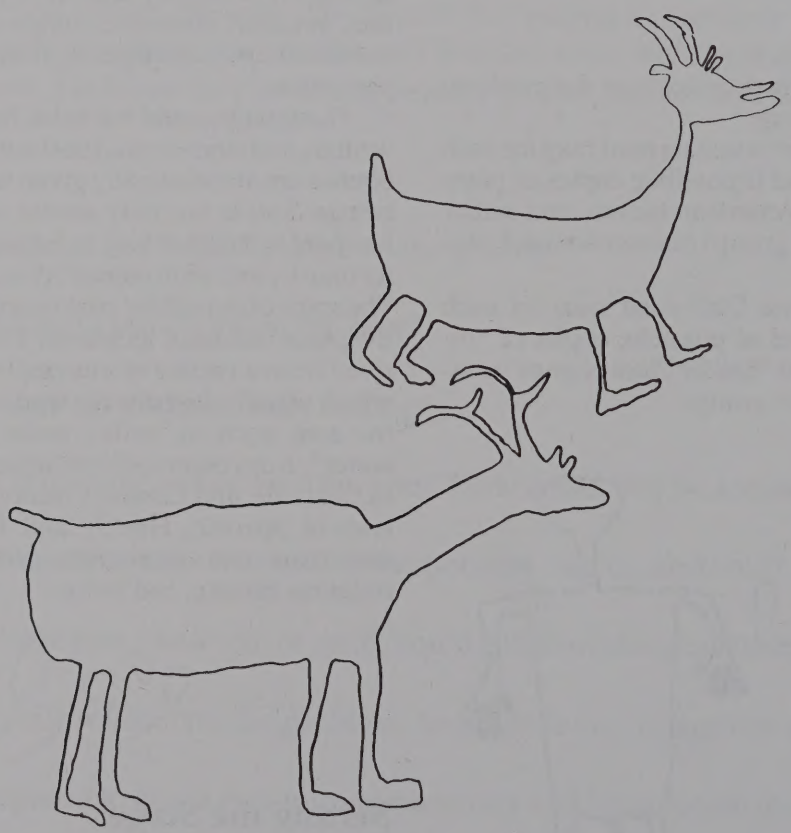




## References:

Harrington, F.C., Florence Kerr, and Darrell J. Greenwell, 1940, *Origins of Utah Place Names*. 3rd ed. Utah Writers Project, Utah State Department of Public Instruction, Salt Lake City, UT.

Van Cott, John W., 1990, *Utah Place Names*. The University of Utah Press, Salt Lake City, UT.



# UTAH INDIAN PLACE NAMES

1. ***Utah -** "Utas," a group of the Ute people.
2. **Uintah -** (Weber) name derived from "Uinta-ats," a large subgroup of the Ute people.
3. ***Wasatch Mts. -** (Salt Lake) a Ute word meaning "mountain pass."
4. **Ibapah -** (Tooele) taken from the Goshute Indian word Ai-bim-pa which means "White Clay Water" or "Milky Water."
5. **Goshute -** (Tooele) a Utah tribe, believed to mean "dust or desert people" in the Ute language.
6. ***Oquirrh - Mountains** (Tooele) a Goshute word meaning "Wooded Mountain," "Cave Mountain," "West Mountain," "Shining Mountain."
7. **Parowan -** (Iron) from Paiute "paragoons" and "pah-o-an" meaning "marsh people" and "bad or harmful water."
8. **Panguitch -** (Garfield) a Paiute word meaning "waters plentiful with fish."
9. **Ouray -** (Uintah) a Ute Indian leader, Peace Chief of the Ute White River Indians.
10. **Kanab -** (Kane) a Paiute word meaning "willow."
11. **Kanosh -** (Millard) a Pahvant Paiute Indian chief—"Kan" means "willow," "Oush" means "bowl."
12. **Peoa -** (Summit) from an Indian name, Pe-oh-a, meaning "to marry."
13. ***Mt. Timpanogos -** (Utah) from Timpanagotzis River, from the Indians living along its banks.
14. ***Oljeto -** (San Juan) (ole-Jay-toe), derived from a Navajo Indian word meaning "moonlight water."
15. **Washakie -** (Box Elder) named for a Shoshone leader who was friendly to the early settlers of northern Utah.

* a place not likely to be listed on road map index

(excerpted from Harrington, et al., 1940, and Van Cott, 1990)

**Note**: Names in parentheses are the counties in which these places are located.

# UTAH SETTLER PLACE NAMES

1. **Provo -** (Utah) named for Etienne Provost, a French-Canadian trapper who visited this region in the 1820s; first called Fort Utah.

2. **Richfield -** (Sevier) named for the richness of the soil; first called Omni for a Book of Mormon character.

3. **Helper -** (Carbon) named by the Denver and Rio Grande Western Railroad because at this point additional locomotives were necessary to help trains westward over Soldier Summit.

4. **Farmington -** (Davis) named as a reminder of the rich soil that encouraged a lifestyle of farming.

5. **Coalville -** (Summit) named after the coal discovery because many of the miners came from Coalville, England.

6. **Brighton -** (Salt Lake) could have been named after a city in England, or for Thomas W. Brighton or William Stuart Brighton, both of whom built homes in the area.

7. **Brigham City -** (Box Elder) named in honor of Brigham Young.

8. **Escalante -** (Garfield) named for Francisco Silvestre Velez de Escalante, a Spanish priest who explored Utah in 1776, although the route he traveled was 150 miles to the west of this town. First called Spud Valley.

9. **Fillmore -** (Millard) named in honor of Millard Fillmore, thirteenth President of the United States.

10. **Cedar City -** (Iron) named because of the abundance of cedar (juniper) trees in the area.

11. **Magna -** (Salt Lake) derived its name from a nearby mine.

12. **Ogden -** (Weber) named after Peter Skene Ogden, a trapper who worked for Hudson's Bay Company in this vicinity in the 1820s.

(excerpted from Harrington, et al., 1940, and Van Cott, 1990)

**Note**: Names in parentheses are the counties in which these places are located.

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# TAKE ACTION—SAVE THE PAST

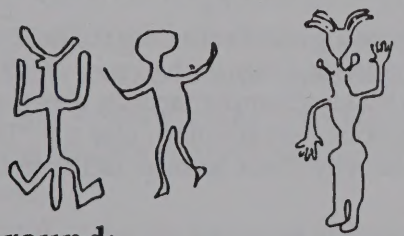
| | |
|---|---|
| SUBJECT: | Science, social studies, language arts |
| SKILLS: | Application, analysis, synthesis, evaluation |
| STRATEGIES: | Brainstorming, decision making, planning, communication, small group work, discussion, research, writing, problem solving, values clarification |
| DURATION: | Approximately 2 to 4 weeks, working 2 to 4 hours each week |
| CLASS SIZE: | Any; groups of 3 to 5, preferably 4 |

## Objective:

In their study of archaeological resource conservation, students will use a problem-solving model to identify a problem and solve it creatively.

## Materials:

A copy of the "Decision Making Sample" and the "Review of the Problem" masters for each team; a copy of Appendix 3: "Rules for Brainstorming" for each student; and a copy of the "Decision Making" activity sheet for each team.



## Background:

The growing concern about destruction of archaeological resources (historic and prehistoric sites and artifacts) lends itself to a creative problem-solving model. Problem solving is a skill students will need for future success. Students use their creative and critical thinking skills to find useful solutions to current and future problems. When possible, students should be supported to carry out their solutions. In recent years, students across the country have been influential and instrumental in finding and implementing solutions to problems by using problem-solving models. Teachers may wish to experiment with the following model. The References list books for those who want more indepth information on using a problem-solving model.

Problem solving is most frequently done in groups of four students. It can also be done as a whole class under the guidance of the teacher.

The more this process is used, the more competent teachers and students become.

## Procedure:

**Step 1: Awareness**

An awareness is created that a problem exists.

**Step 2: Researching the Problem**

Researching information about the problem is essential to problem solving. Students who have experienced many lessons from this teaching guide will have sufficient background for solving archaeological problems. These lessons together with reading the "Review of the Problem" may be adequate preparation for completing the process. Additional research may be done if the students think they do not have enough information.

**Step 3: Brainstorming Problems**

Students will brainstorm a list of *specific* problems related to the overall problem of archaeological resource destruction. This will help to clarify the problem. Encourage students to list as many problems as possible (10 to 25). Examples: (1) digging up sites destroys valuable research data; (2) archaeologists cannot learn as much if artifacts are taken away or stolen from a site; (3) Indians think graves of their ancestors that are dug up have been desecrated; (4) tourists cannot enjoy and learn from sites if they have been destroyed.

**Step 4: Identifying the Underlying Problem**

The students now select the one problem from their list that they think is the most important; "... it should be one which, if solved, might solve many of the other problems on the list as well. It may appear individually on the list or it may be a combi-

nation of a number of problems on the list" (Crabbe, 1988, p. 40).

The problem is most easily solved if it is stated as a question beginning with the phrase, **HOW MIGHT WE . . . ?** or **IN WHAT WAYS MIGHT WE . . . ?** and contains *one* main verb. Example: **How might we** *preserve* archaeological sites for enjoyment by the public during the next 100 years? **In what ways might we** *involve* community members in the preservation of archaeological resources?

**Step 5: Brainstorming Solutions**

"Once the underlying problem has been identified and written, the teams should begin their quest for solutions. This is the time for truly creative brainstorming. Students should stretch their minds as they look for actual ways to resolve the issue they have described" (Crabbe, 1988, p. 44). Refer to Appendix 3: "Rules for Brainstorming" before beginning step 5.

**Step 6: Choosing and Evaluating the Best Solution**

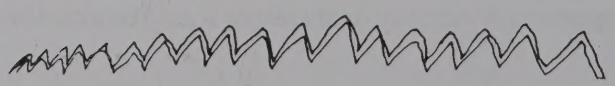
Students should read over their list of solutions and pick their 10 best solutions. From this list they will choose their best solution. (See "Decision Making Sample" activity sheet.) This is done by establishing a set of criteria by which to judge each solution. The criteria should be stated as a question, be problem specific, and establish lasting effects. Examples: Which solution will have the *longest lasting* preservation effect on the archaeological sites in our state? Which solution will be the *quickest* to implement in our state? Which solution will be the *easiest* to implement in our state? Which solution will *cost the least* to the state taxpayer? Which solution will *influence the most* people? Which solution will *involve the most* community members in the preservation of archaeological resources?

**Step 7: Describing the Best Solution**

In paragraph form the students describe how they will carry out their solution. They should answer the questions: Who? What? Why? Where? When? and How?

**Step 8: Carrying Out the Solution**

When possible provide students with an opportunity to carry out their solution. Example: If their best solution is to create an educational display for a visitor center in a national park (or other location), allow time for the construction of the display and arrange for permission to show it.



## A Sample of the Process

**Step 1: Awareness**

Students are made aware that a problem exists. This can be facilitated by teaching students about archaeology and reading "A Review of the Problem."

**Step 2: Researching the Topic**

Depending on students' knowledge of archaeology, research may be necessary.

**Step 3: Brainstorming Problems**

a. Digging in sites destroys the chronology of a site.
b. We as a society lose a piece of our heritage if artifacts are taken away or stolen from a site.
c. Theft of grave goods injures the living descendants of ancient people.
d. Other.

**Step 4: Identifying the Underlying Problem**

**In what ways might we** *lessen* the destruction by tourists of archaeological sites?

**Step 5: Brainstorming Solutions**

a. Create brochures about how and why to protect sites, and put the brochures in a park visitor center.
b. Write a letter to the editor of a newspaper discussing the importance of protection.
c. Talk about the problem of destruction on a radio talk show.
d. Other.

**Step 6: Choosing and Evaluating the Best Solution**

Using criteria, judge each of your solutions (see "Decision Making Sample" activity sheet) and then decide on your best solution. Use the "Decision-making" activity sheet to help facilitate this process.

**Step 7: Describing the Best Solution**

In paragraph form, describe how you will carry out your solution. You should answer the questions: Who? What? Why? Where? When? and How?

**Step 8: Carrying Out the Solution**

Put your best solution into a plan of action, and do it.

## References:

Crabbe, Anne B., 1988, *The Coach's Guide to the Future Problem Solving Program.* The Future Problem Solving Program, Laurinburg, NC.

Lewis, Barbara A., 1990, *The Kid's Guide To Social Action.* Free Spirit Publishing Inc., St. Paul, MN.

# Review of the Problem

Out there, in the vast expanse of public lands, Americans are being plundered, robbed of a history that the land has held for thousands of years. This history has been passed down to us by the people who were here before us. They have left artifacts, drawings, and ruins of their way of life. Archaeologists study these ruins, drawings, and other artifacts left by the early Americans, to discover clues to past cultures.

Some of these areas are far off the beaten path and some have been set aside as deserving of special protection. In the past, only the hearty outdoors enthusiast made the difficult journey to these sites. Today, many roads and highways cross the land, making it easier for many people to visit sites—including vandals, professional scavengers, casual collectors, and tourists.

Many ancient sites have been damaged in some way. Unless we act now to save this piece of our American past, there may not be anything left to save. Large quantities of pottery, human skeletal remains, rock art, historic cabins and trails, as well as other valuable clues to our past have been damaged.

The large numbers of people visiting sites are endangering their existence. Visitors climbing in and out of ruins damage archaeological evidence. Campers building campfires near sites can harm rock art. Wood pulled from the roofs of prehistoric and historic buildings to build campfires can cause them to collapse. Each shovelful of dirt that is taken out of these sites may cause a loss of knowledge about past people. Each time a skeleton is unearthed and its bones scattered, we lose another link in our American heritage. Rock art is changed beyond repair each time uninformed or uncaring people chalk over a pictograph so it can be photographed, add their own carvings to a petroglyph for amusement or chisel a part of the art away from the wall. Each time artifacts are destroyed or removed from a site, the past culture can no longer be accurately dated and studied.

The worst thing about vandalism and destruction of historic and prehistoric sites is the finality of the situation; the loss of history is complete and can never be recovered.

Federal and state agencies are working to prevent this destruction, with the help of concerned citizens. As guardians of our public lands, these agencies (such as the Bureau of Land Management, Forest Service, Fish and Wildlife Service, Bureau of Reclamation, Department of Defense, Bureau of Indian Affairs, National Park Service and state governments) safeguard these special places.

You can help. You can learn about artifacts and their value in the search for knowledge of the past. You can contact archaeological groups or historic societies in your area to find out how you can learn more. You can teach others about the importance of archaeological sites. You can form citizen groups who watch over sites. You can help prevent further destruction of these sites and become involved in legal and meaningful archaeology projects.

There are many other solutions to the problem of archaeological resource destruction. Your creative ideas are needed now!

# Decision Making Sample

**Directions**
Follow the letters (**A-D**) to complete this step. Some examples are given for you.

**A.** Summarize your best solutions.

**B.** Write your criteria in each diagonal.

| | Which solution will have the longest lasting preservation effects on archaeological sites in our state? | Which solution will influence the most people in our state? | Which solution will be the quickest to implement in our state? | | | Total |
|---|---|---|---|---|---|---|
| 1. Create imitations of actual sites that tourists may visit and dig in. | 5 | 1 | | | | D.14 |
| 2. Design a TV advertisement teaching people about site preservation. | 4 | 5 | | | | |
| 3. Write letters to the editor of the local newspaper. | 1 | 3 | | | | |
| 4. | 2 | 4 | | | | |
| 5. | 3 | 2 | | | | |

SAMPLE

**C.** Rate each solution according to each criterion on a scale of 1-5 (5 is highest, 1 is lowest). Use each number only once.

**D.** Add the numbers across each solution line. Your highest number is your best solution. In the case of a tie, combine the 2 ideas into a super solution.

# Decision Making

| Solutions | Criteria | | | | | Total |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |
| 9 | | | | | | |
| 10 | | | | | | |





# APPENDIX ONE

## CROSS REFERENCE BY SKILLS AND STRATEGIES

**SKILLS**

**Knowledge**
Why Is the Past Important?
Culture Everywhere
Observation and Inference
Context
Chronology: The Time of My Life
Classification and Attributes
Gridding a Site
Stratigraphy and Cross-dating
Archaeology and Tree-ring Dating
Pollen Analysis
Measuring Pots
Experimental Archaeology: Making Cordage
Archaeology as a Career
Rock Art One: An Introduction
State Place Names

**Comprehension**
Culture Everywhere
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**Application**
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**Analysis**
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**Synthesis**
Context
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**STRATEGIES**

**Analogy**
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**Brainstorming**
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**Categorize**
Culture Everywhere



**Classification**
Classification and Attributes
Scientific Inquiry
It's in the Garbage
Artifact Classification

**Communication**
Rock Art Three: Protecting Our Past
Artifact Ethics
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**Compare and Contrast**
Culture Everywhere
Classification and Attributes
State Place Names

**Composing**
Artifact Ethics
A Journey Back In Time: A Guided Imagery

**Computation**
Archaeology and Tree-ring Dating
Measuring Pots
Experimental Archaeology: Making Cordage

**Debate**
Artifact Ethics
The Road Showdown
Archaeology–A Conservation Issue

**Decision Making**
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Rock Art Four: Creative Expression
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**Discussion**
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Culture Everywhere

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**Drawing**
Rock Art One: An Introduction
Rock Art Two: Creating Your Own
Rock Art Three: Protecting Our Past
Artifact Ethics
A Journey Back In Time: A Guided Imagery

**Experiment**
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**Forecasting**
Chronology: The Time of My Life
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Pollen Analysis

**Game**
Context

**Graphing**
Pollen Analysis

**Guided Imagery**
A Journey Back In Time: A Guided Imagery

**Interviewing**
Archaeology As A Career
Grave Robbers

**Invention**
Experimental Archaeology: Making Cordage
Rock Art Three: Protecting Our Past

**Mapping**
Gridding A Site
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**Observation**
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Archaeology and Tree-ring Dating
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**Planning**
Take Action—Save The Past

**Problem Solving**
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**Reading**
Archaeology and Ethnographic Analogy:
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Experimental Archaeology: Making Cordage
Archaeology as a Career
Grave Robbers

**Research Skills**
Scientific Inquiry
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Archaeology as a Career
Take Action—Save the Past

**Role Play**
Artifact Classification
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The Road Showdown
Archaeology—A Conservation Issue

**Scientific Inquiry**
Observation and Inference
Classification and Attributes
Scientific Inquiry
Its in the Garbage
Gridding a Site
Artifact Classification
Experimental Archaeology: Making Cordage

**Sculpting**
Rock Art Four: Creative Expression

**Sequence**
Chronology: The Time of My Life
It's in the Garbage

**Using Scale**
Gridding a Site

**Values Clarification**
Rock Art Three: Protecting Our Past
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**Visualization**
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**Writing**
Observation and Inference
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# APPENDIX TWO

## VOCABULARY

**archaeology**: a method for studying past human cultures and analyzing material evidence (artifacts and sites).

**archaeological site**: a place where human activity occurred and material remains were left.

**artifact**: any object made or used by humans.

**attribute**: characteristics or properties of an object such as size, color, or shape.

**behavioral inference**: conclusions about human behavior; archaeologists make inferences about the behavior of past people based on objects.

**Cartesian coordinate system**: two- or three-dimensional graph based on intersecting, incremented lines or planes .

**chronology**: an arrangement of events in the order in which they occurred.

**classification**: systematic arrangement in groups or categories according to established criteria.

**context**: the relationship artifacts have to each other and the situation in which they are found.

**coprolites**: fossilized feces. (usually human)

**cordage**: several strands of fiber twisted together; string or rope.

**cross-dating**: the principle that a diagnostic artifact dated at one archaeological site will be of the same approximate age when found elsewhere.

**culture**: the set of learned beliefs, values and behaviors generally shared by members of a society. "The way the members of a group of people think and believe and live, the tools they make, and the way they do things" (Braidwood 1967:30).

**cultural relativism**: studying other cultures without judgments or categories from one's own culture.

**cultural resources:** a definite location of past human activity, occupation, or use identifiable through field inventory (survey), historical documentation, or oral evidence; includes prehistoric and historic sites.

**data**: information, especially information organized for analysis.

**datum**: something to use as a basis for measuring.

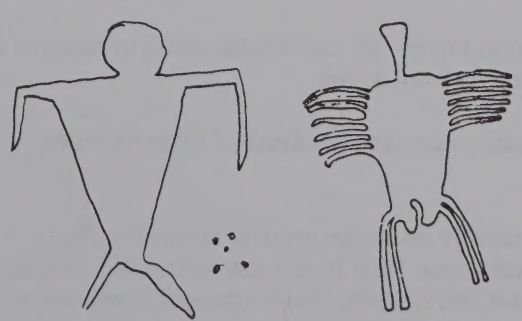
**deface**: spoiling or marring the surface or appearance of something.

**dendrochronology**: determining the age of a tree by counting its rings; the study of tree-ring dating.

**diagnostic artifact**: an item that is indicative of a particular time and/or cultural group; a computer would be a diagnostic artifact of the modern age.

**dialect**: a regional variety of a language.

**ethnocentrism**: the attitude that one's traditions, customs, language, and values are the only right and proper way and that other cultures are inadequate or wrong.



**ethnographic analogy**: inferring the use or meaning of an ancient site or artifact based on information from ethnographic sources.

**ethnography**: description of a culture based on observation of and interaction with living people.

**evidence**: data which are used to prove a point or which clearly indicate a situation.

**excavation**: systematic uncovering and recording of archaeological sites.

**experimental archaeology**: scientific studies designed to discover processes that produced and/or modified artifacts and structures that are found in archaeological sites.



**fiber**: a slender threadlike strand or string. Bast fibers are the long fibers from a plant stalk.

**flake**: a thin piece of stone removed from a nodule by striking it with a flaker made of bone, antler, or other stone. Flakes have sharp edges, and could be used as cutting implements. Flakes were also further shaped into tools or were left as waste by-products of flintknapping.

**grid unit**: a specific spatial area on the Cartesian coordinate system, designated by the co-ordinate in one corner (usually the southwest corner).

**hypothesis**: a proposed explanation accounting for a set of facts that can be tested by further investigation.

**increment borer**: an instrument used to remove a core sample from a tree.

**inference**: a conclusion derived from observations.

**kiva**: usually an underground structure, for ceremonial use. First built by the Anasazi people, Hopi and Rio Grande Pueblo people continue to build and use kivas today.

**land manager**: an employee of a federal land managing agency (such as the Bureau of Land Management or U. S. Forest Service) with authority to decide how land under the jurisdiction of the agency and the resources on it will be used. Effects on cultural resources are among the factors weighed in a decision.

**midden**: an area used for trash disposal.

**myth**: usually a traditional story of presumably historical events that serves to unfold part of a world view of a people or explain a practice, belief, or natural phenomenon.

**observation**: recognizing or noting a fact or occurrence.

**Paiute**: an Indian tribe whose traditional territory included the Great Basin of California, Nevada, Oregon, Utah and Idaho.

**palynology**: the study of pollen grains.

**petroglyph**: a design chiseled or chipped out of a rock surface.

**pictograph**: a design painted on a rock surface.

**Pleistocene**: the Ice Age; the epoch of geologic time from 1.6 million years ago to 10,000 years ago, characterized in North America by periods of glacial advance and retreat.

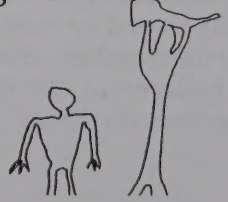
**pollen**: a powdery substance produced by flowering plants. Pollen is the male genetic material, which pollinates (fertilizes) the female part of the flower to produce fertile seeds.

**pot sherd**: a piece of broken pottery

**replication**: the act or process of reproducing artifacts, structures, and use patterns.

**rock art**: a general term for the pecking, incising, or painting of designs onto rock surfaces.

**rock art panel**: a group of pictograph and/or petroglyph figures.



**sherd**: a piece of broken pottery.

**sinew**: animal tendon prepared to use as cord or thread.

**site datum**: an arbitrarily established point from which the entire site is measured and recorded.

**spatial**: concerned with space.

**strata**: layers of earth.

**stratigraphy**: the layering of deposits in archaeological sites. Cultural remains and natural sediments become buried over time; the layer on the bottom is the oldest, the layer on the top is youngest.

**stratum**: one layer of earth.

**survey**: a systematic examination of the surface of the land for the purpose of locating and recording archaeological sites.

**symbol**: a thing which represents something else.

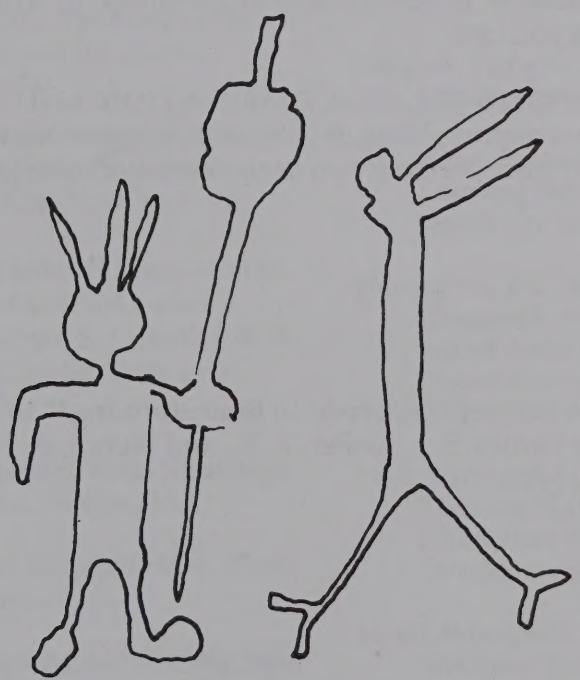
**technology**: the technique or means for making or doing something, often associated with tool making.

**temporal**: concerned with time.

**timeline**: a visual representation of events in chronological order.

**vandalism**: willfully or maliciously defacing or destroying public or private property.

**vessel**: a hollow or concave utensil for holding something.





## APPENDIX THREE

# RULES FOR BRAINSTORMING

1. **CRITICISM IS RULED OUT**
   Judgement of positive and negative ideas must be withheld. No one should criticize anyone else's ideas.

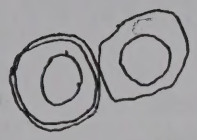
2. **FREEWHEELING IS WELCOME—THE WILDER THE BETTER**
   It is easier to tame down than to think up ideas. Don't be afraid to say anything that comes into your mind--the farther out the idea the better. This complete freedom stimulates more and better ideas.

3. **QUANTITY IS WANTED**
   The greater the number of ideas, the more likelihood of winners. Come up with as many ideas as you can.

4. **TRY PIGGYBACKING IDEAS—COMBINATION AND IMPROVEMENT**
   In addition to contributing ideas of your own, suggest how ideas of others can be turned into better ideas, or how two or more ideas can be joined into still a better one.

**Reference:**

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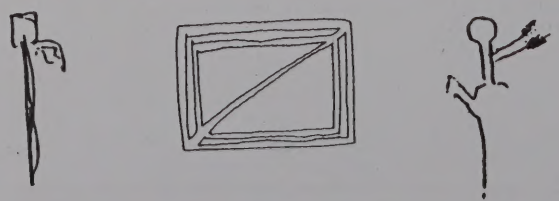
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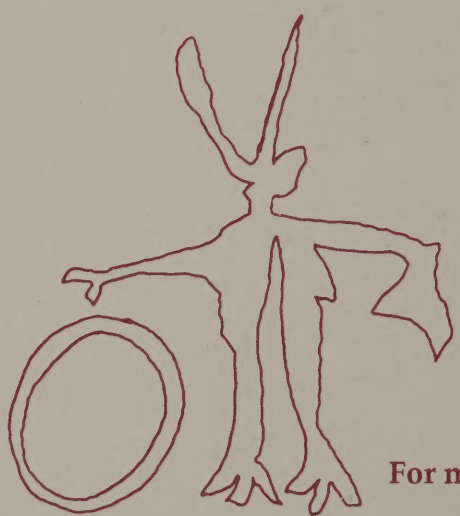
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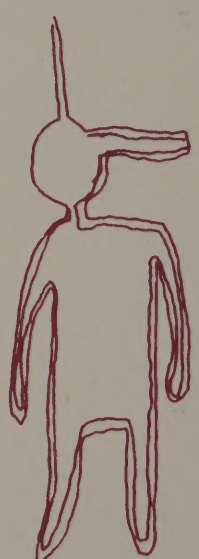


# INTRIGUE OF THE PAST

## A Teacher's Activity Guide








**For more information, contact:**

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Bureau of Land Management
Anasazi Heritage Center
P.O. Box 758
Dolores, Colorado 81323
(970) 882-4811

Internet Webb Site
http://www.co.blm.gov/ahc/projectarch.htm